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Grain Shape and Size Distribution Effects in Coastal Models

by
J. Ian Collins and Charles B. Chesnutt

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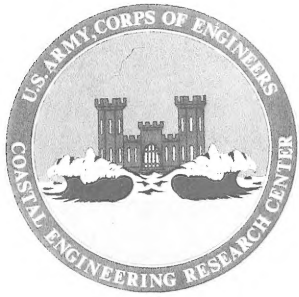

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Noda (1971, 1972) proposed a two-dimensional, coastal movable-bed, scale-model relationship with four basic scale ratios: (a) horizontal scale, (b) vertical scale, (c) sediment-size ratio, and (d) relative specific weight ratio. The model law was derived by empirically matching the distance from the stillwater level (SWL) intercept to the toe of the foreshore.

This study was conducted to investigate the effects of the model sediment-size distribution and particle shape in movable-bed models and, if possible

further refine Noda's scale relationship. An experimental evaluation of the scale model relationship was also performed.

The results showed that the effects of grain shape and size distribution are varied. In many cases there was little or no measurable effect; in others, particularly for smaller wave steepnesses, marked differences were apparent. These included multiple bars on profiles consisting of sediment with a bimodal sediment-size distribution and an unstable bar on profiles consisting of sediment with a very narrow unimodal size distribution or a spherical grain shape. Recommendations are made to avoid such sediments as possible model materials.

The experiments showed that the initial profile slope influences the final stable profile shape. Under identical experimental conditions, the position of the longshore bar on the final stable profile varied between experiments, indicating that defining the "equilibrium profile" is not as straightforward as has been assumed. "Rocklite," a manufactured, lightweight ceramic sediment, was a potentially useful model material.

The model evaluation tests were only partially successful. The slope of the foreshore was reproduced in scale, but the shape of the offshore and surf zones and the movement of the shoreline were not reproduced. The general results tend to confirm the difficulties of obtaining successful beach models in similitude.

PREFACE

This report is published to provide coastal engineers with a further analysis and evaluation of the two-dimensional coastal movable-bed scale-model relationship proposed by Noda (1971, 1972). The work was carried out under the coastal processes program of the U.S. Army Coastal Engineering Research Center (CERC).

The report was prepared by J. Ian Collins, Tetra Tech, Inc., Pasadena, California, under CERC Contract No. DACW72-72-C-0024, and by Charles B. Chesnutt, CERC.

The work of Messrs. A. Yuen and C. Pettit, who conducted the experiments, and Mr. G. Smith, who handled the data reduction, is gratefully acknowledged. The authors express their appreciation to Drs. E. Noda, C. Sonu, and B. LeMehaute, who contributed much to this study through many useful discussions.

Charles B. Chesnutt was the CERC contract monitor, under the general supervision of Dr. C.J. Galvin, Jr., Chief, Coastal Processes Branch, Research Division.

Comments on this publication are invited.

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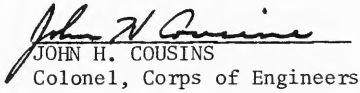

JOHN H. COUSINS
Colonel, Corps of Engineers
Commander and Director

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A	maximum projected area of a sediment particle normal to its line of motion
C_c	Chezy coefficient
d	local water depth
D	sediment particle diameter
$\overline{D}$	characteristic sediment size
D_{50}	median diameter of sediment particle
F	Froude number
F_*	densimetric Froude number
F_{*C}	critical densimetric Froude number for the initiation of sediment motion
f	friction factor
f_1, f_2	arbitrary functions
g	gravitational constant
H	wave height
H_b	breaking wave height
H_o	deepwater wave height
i_o	initial beach slope
k	$2\pi/L$, wave number
L	wavelength
L_o	deepwater wavelength
$n_{quantity}$	scale ratio of "quantity"
R	Reynolds number
R_*	shear Reynolds number
R_{*c}	critical Reynolds number for the initiation of sediment motion

R_H	hydraulic radius
S	slope
S_e	energy slope
s.g.	specific gravity
T	wave period
U	steady flow velocity
u	horizontal velocity
u_b	bottom velocity
u_m	mass transport velocity
u_{x_c}	critical bottom-shear velocity for initial sediment motion
V	volume of sediment particle
W	settling velocity
X	horizontal coordinate axis
Y	vertical coordinate axis
Y_s	vertical distance between beach crest and bar or step
α	proportionality symbol
β	beach profile discontinuity distance
γ	specific weight
γ'	$(\gamma_s - \gamma_f)/\gamma_f$, relative specific weight
γ_f	specific weight of fluid
γ_s	specific weight of sediment particles
λ	horizontal scale ratio
μ	vertical scale ratio
ν	fluid kinematic viscosity
π	3.14159 (numerical constant)

ρ_f	density of fluid
τ_c	critical bottom shear stress for initial sediment motion
τ_o	bottom shear stress
Ω	μ/λ, distortion
ω	$2\pi/T$, circular frequency

GRAIN SHAPE AND SIZE DISTRIBUTION EFFECTS IN COASTAL MODELS

by
J. Ian Collins
and
Charles B. Chesnutt

I. INTRODUCTION

Movable-bed scale models aid in the solution of many engineering problems encountered in the nearshore zone. However, such models must rely heavily on practical experience rather than on theoretical predictions since it is not possible to model the complete physics of the nearshore environment.

In general, scale models are expected to reproduce the dominant physical phenomena governing the behavior of the prototype. Hence, two essential steps are necessary: (a) The dominant phenomena must be identified and measured; and (b) the feasibility of modeling these phenomena must be demonstrated. In movable-bed coastal models it is uncertain if either of these steps can be accomplished satisfactorily at present.

The real need for an engineering model is to reproduce a known condition or history of events. Generally, it is unnecessary (or impossible) to model all of the details and, in fact, such a modeling is probably not desirable.

The approach taken by the scientist is to establish a set of scale relationships ("theoretical similitude") based on reproducing the dominant physical phenomena. To the dissatisfaction of both the scientist and the engineer, this approach has not worked.

The engineer, confronted with a specific problem and an immediate need for a solution, must attempt to reproduce a known history of events ("practical similitude") and not be overly concerned with obtaining theoretical similitude.

This study is one of a series of reports prepared by Tetra Tech, Incorporated, Pasadena, California, under contract to the U.S. Army Coastal Engineering Research Center (CERC). The first reports by Fan and LeMehaute (1969) and LeMehaute (1970) reviewed all the conditions of theoretical similitude and proposed some guidelines to aid the engineer. Noda (1971, 1972), in a following report, proposed a general scale-model relationship for coastal engineers based upon obtaining a practical similitude of equilibrium beach profiles. Relationships between the horizontal and vertical scales, and the sediment specific weight and median-diameter ratios were developed empirically, based upon modeling the distance between the stillwater level (SWL) intercept and the beach discontinuity on step-type profiles (Fig. 1a). Noda assumed that duplicating this distance would provide a model applicable to all distances.

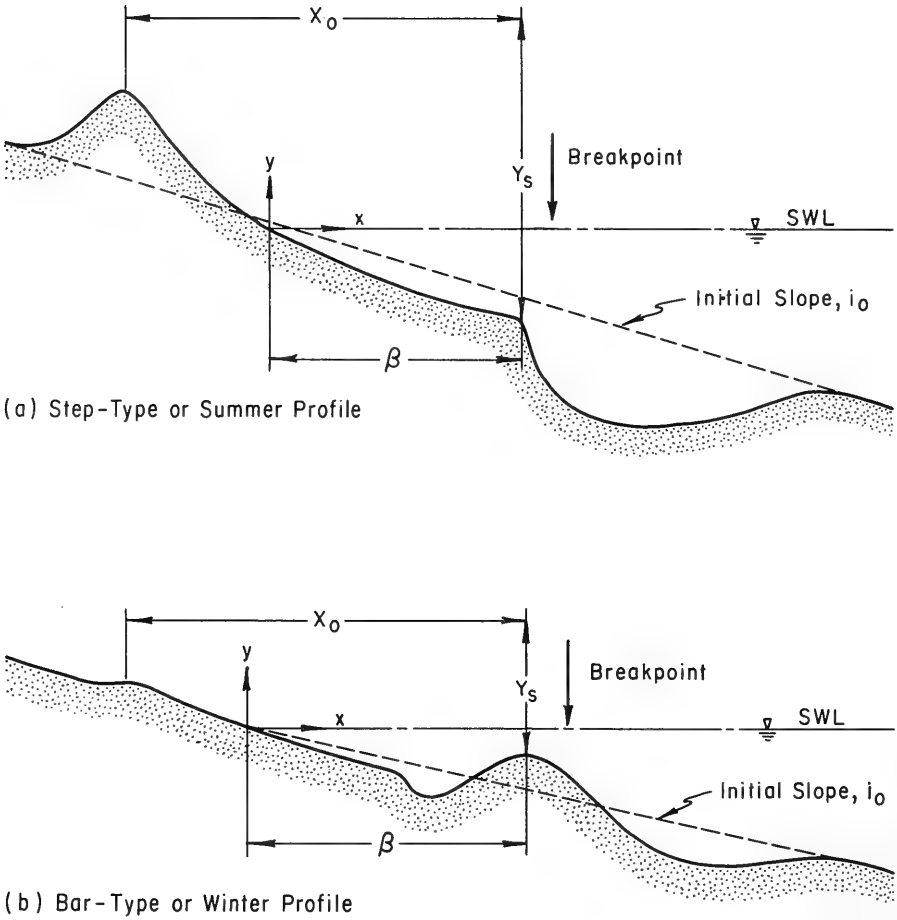

Figure 1. Examples of beach profile classifications.

This study was conducted to further refine Noda's (1972) empirical scale-model relationship and evaluate the validity and applicability of that model law. The study plan consisted of three parts:

(a) Investigation of the effects of sediment-size distribution on scale models;

(b) investigation of the effects of sediment shape on scale models; and

(c) experiments by Tetra Tech, Incorporated, and evaluation by CERC of the validity of the proposed scale-model law.

II. REVIEW OF LITERATURE ON EQUILIBRIUM PROFILES AND BEACH MODELING LAWS

1. Hydrodynamic Conditions.

Fan and LeMehaute (1969) and Noda (1971) reviewed in detail the hydrodynamic conditions required for theoretical similitude and reduced those conditions to the equations presented below. The term $n_{quantity}$ denotes the ratio of model to prototype with the subscript indicating the parameter being modeled and λ and μ are the horizontal and vertical scales, respectively.

a. Condition 1. Coastal fluid phenomena are generally dominated by gravitational and inertial forces and hence the Froude number F is an important parameter:

$$F = \frac{u}{(gd)^{1/2}} . \tag{1}$$

The requirement that $n_F = 1$ yields:

$$\frac{u_m}{u_p} = \left(\frac{d_m}{d_p}\right)^{1/2} , \tag{2}$$

where subscripts m and p refer to model and prototype values respectively, and thus:

$$n_u = \mu^{1/2} . \tag{3}$$

A major parameter affecting beach profiles is the deepwater wave steepness, H_o/L_o; if this parameter is to be preserved in model and prototype, then the wavelength must be proportioned like the vertical scale and consequently,

$$n_L = \mu . \tag{4}$$

Since the wavelength is related to the wave period by:

$$L = \frac{gT^2}{2\pi} \tanh \frac{2\pi d}{L} \quad , \tag{5}$$

then the scale ratio for the period becomes:

$$n_T = \mu^{1/2} \quad . \tag{6}$$

The scaling of the wavelength with the vertical scale preserves the refraction pattern, but produces a model wavelength larger by the distortion $\Omega = \mu/\lambda$.

b. Condition 2. The preserving of the same Froude number F_* based on the grain size and bed-shear velocity gives:

$$n_{\gamma'} n_D = n_{u_*}^2 \quad . \tag{7}$$

c. Condition 3. The requirement of identical Reynolds number R_* and assuming the viscosity ratio is 1 produce:

$$n_{u*} n_D = 1 \quad . \tag{8}$$

d. Condition 4. The scale ratio for the bed-shear velocity under turbulent conditions is:

$$n_{u_*} = \mu^{1/2} n_{\bar{f}}^{1/2} \quad . \tag{9}$$

e. Condition 5. The scale ratio for the friction factor is:

$$n_{\bar{f}} = \frac{\mu}{\lambda} \quad . \tag{10}$$

f. Condition 6. The kinematic condition for sediment motion becomes:

$$\frac{n_u}{n_w} = \frac{\lambda}{\mu} \quad , \tag{11}$$

and substituting equation (3) yields:

$$n_w = \mu^{3/2}/\lambda \quad . \tag{12}$$

g. Condition 7. The Stokes sediment particle fall velocity in scale-ratio form becomes:

$$n_w = n_D^2 n_{\gamma'} \quad . \tag{13}$$

2. Beach Profile Parameters.

The terminology for the coastal zone used in this report is described in Figure 1. Noda's (1972) law was based on modeling the "equilibrium profile" and, although there is a wealth of published profile data, most of the data are not useful because the profiles were formed under many varying wave conditions or, in laboratory experiments, under different experimental procedures. The figure illustrates the two most broad classifications of beach profiles as a bar-type or step-type.

Equilibrium profile implies a profile whose mean position is fixed in space for the given wave conditions, with the expectation that the actual profile at any given time will deviate from the mean profile; also, equilibrium is a state which will be reached on a model beach subjected to constant wave action for a sufficiently long time. The equilibrium profile of a beach is a function of the wave characteristics such as wave height, wavelength, wave period, and the sediment characteristics (e.g., specific gravity and median diameter).

A noticeable distinction of both laboratory and prototype beach profiles is the formation of "winter" (bar) and "summer" (step) shapes under different deepwater wave-steepness conditions (H_o/L_o). The winter or "storm" profiles (Fig. 1b) are usually formed under large wave-steepness conditions and are characterized by the erosion of material from the foreshore zone to the offshore zone, producing a flatter foreshore gradient and the distinctive formation of longshore bars. The summer or "ordinary" profiles (Fig. 1a) are usually produced under small wave-steepness conditions and are characterized by an accretion of material on the beach face and in the breaker zone, producing a steep foreshore slope and no longshore bar formation. This is an oversimplification because it is possible to have beach profiles between these two idealized types, and other complications, including multiple bars, are frequently found. On prototype beaches the actual beach profiles are functions not only of the waves and sediment present, but are greatly influenced by the availability of littoral supply of sediment.

Johnson (1949) suggested the range of deepwater wave steepness 0.025 to 0.03 alone represented the transition zone between summer and winter profiles. Watts (1954) and Rector (1954) indicated that although the deepwater wave steepness was important, other parameters such as sand characteristics affected the beach profile. Saville (1957), testing under prototype conditions, found that for a wave steepness as small as 0.0023, a winter-type beach was formed.

Bagnold (1940) suggested that the ratio of the deepwater wave height to the grain diameter was an important parameter in obtaining beach profile similarity. Bascom (1951) added credibility to this parameter by showing that for prototype conditions the foreshore slope was related to the median-grain diameter. Wiegel (1964) extended this data and showed the effects of changes in the wave characteristics.

Iwagaki and Noda (1962) tested this theory by using both H_o/L_o and H_o/D_{50} as parameters to determine the criterion for the formation of longshore bars. Nayak (1970) extended this work to include material of a different specific weight than sand and proposed another criterion for the formation of longshore bars based on the parameters H_o/L_o and $H_o/\gamma' D_{50}$ (Fig. 2). The literature on equilibrium beach profiles was also discussed by Nayak (1970).

Some investigators also attempted to find empirical equations to describe the beach equilibrium profile. Rector (1954) derived empirical power-law equations to describe the average beach slope, using laboratory data. Eagleson, Glenne, and Dracup (1963) derived an empirical equation for the offshore profile where the shear velocity was based on laminar flow in the boundary layer. Yalin (1963) derived a model-law relationship for the offshore zone also using a bed velocity based on laminar boundary layer conditions. Larras (1961) determined an empirical relation for the profile in the breaker zone in the form of a power-law relationship which has not been found to be very useful. Many investigators tried to quantify some of the most important characteristics of a beach profile. This requires a choice of parameters useful to define the beach profile. The work of Sitarz (1963) appears to be the most comprehensive, although other investigators, including this study, have not found very close agreement with his proposed relationships (see Fig. 3, and Bonnefille and Pernecker, 1965).

Nicholson (1968) showed that certain beach profile parameters are apparently a function of H_o/L_o only within certain ranges of H_o/L_o, but for other ranges of H_o/L_o the beach profiles are influenced by the fall velocity of the sediment particles. Figure 4 shows that for small H_o/L_o (less than 1.5×10^{-2}) and for large H_o/L_o (greater than 6×10^{-2}), beach profiles can be produced in similitude using sand; i.e., if Y_s, the vertical distance from beach crest to step or bar is proportional to H_o, modeling is feasible. However, Nicholson's (1968) experiments cover only a relatively narrow range of beach parameters for prospective scale models and the results from the present studies do not confirm the results for sand alone.

3. Dimensional Analysis.

Keulegan (1948), Rector (1954), Kemp (1960), Nicholson (1968), Paul, Kamphuis, and Brebner (1972), Kamphuis (1972), and other investigators listed governing parameters for the sediment-water interaction on a beach and derived many dimensionless groups for defining beach processes. Rector (1954) presented one of the most complete set of groups and even included wave sorting in his initial formulation but dropped these terms during subsequent analysis. Generally, the dimensionless groups are considered in three subgroups: (a) Waves, (b) sediment, and (c) interaction. The wave subgroup includes terms such as H_o/L_o, d/L_o, and P/T, whereas the sediment subgroup has many single terms such as σ_ϕ, i_o, and γ'; wave-sediment interaction subgroup includes F_*, R_*, and H_o/D_{50} (see following definitions). By various cross products, it follows that the

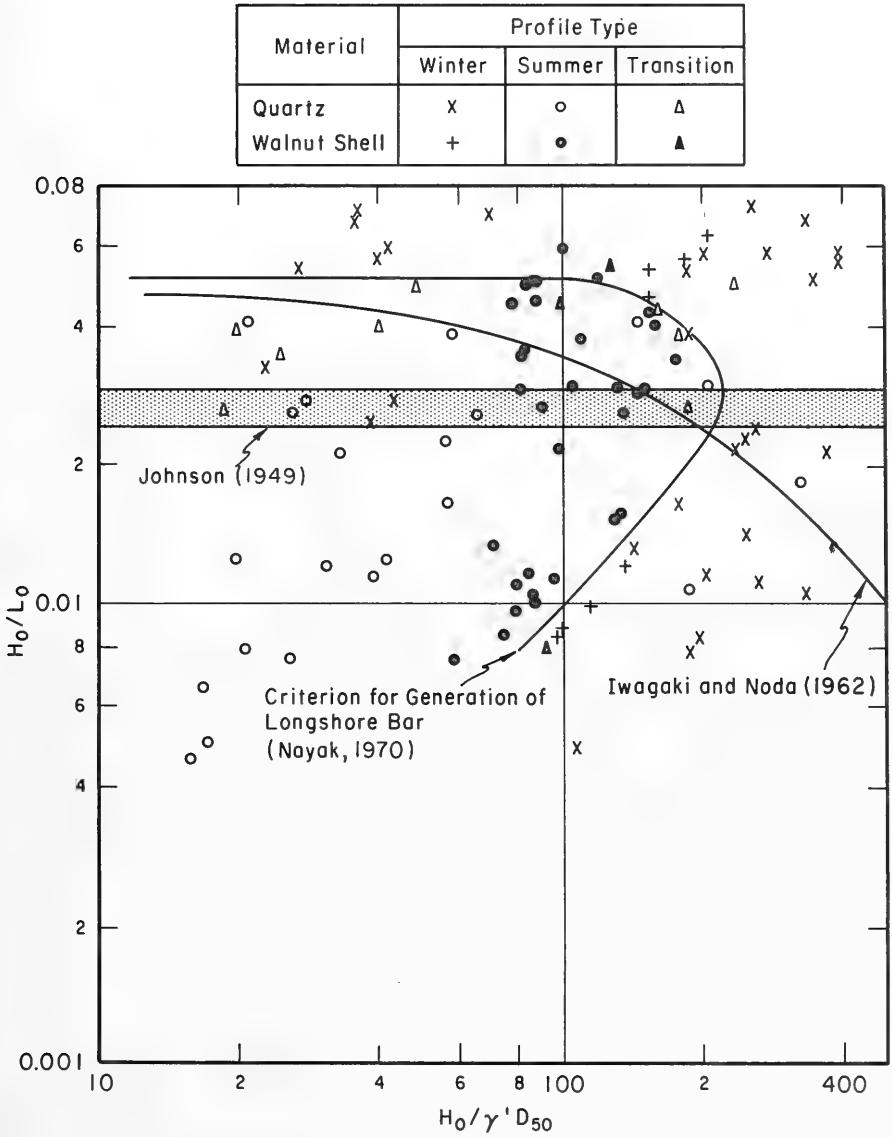

Figure 2. Criterion for generation of longshore bars (Nayak, 1970).

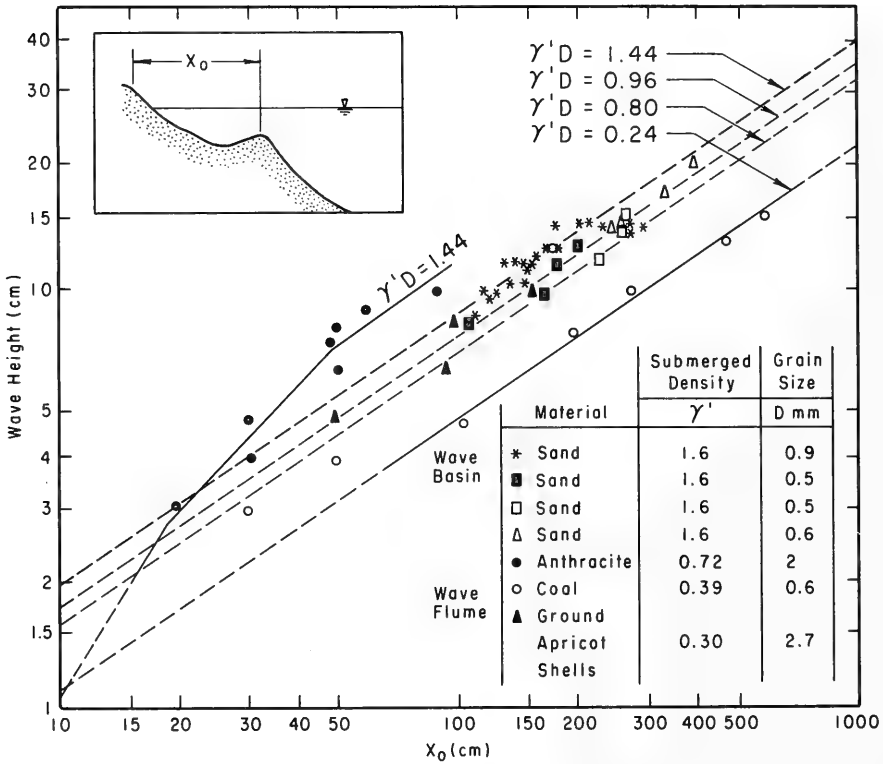

Figure 3. Beach crest to bar distance (Sitarz, 1963).

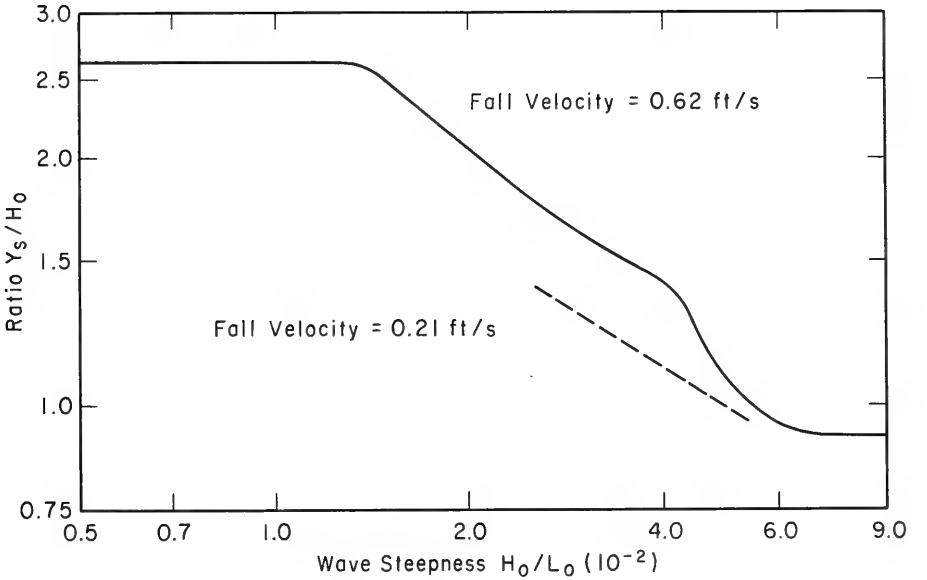

Figure 4. Relationship between vertical crest to bar or step distance and wave steepness (Nicholson, 1968).

dimensionless groups of H_o can also be placed in a form involving L_o, d, or gT^2, and various investigators have stated preferences.

However, based on overall considerations, the various sets can be considered as follows:

$$f_1\left(\frac{x}{y}, \frac{x}{H_o}, H_o/L_o, P/T, \sigma_\Phi, S, i_o, \gamma', F_*, R_*, H_o/D, \frac{u}{W}\right) = 0 \quad , \qquad (14)$$

where,

the equilibrium (assumed) beach profile is given by the curve $y(x)$

H_o = deepwater wave height for normal approach,

P = period from wave breaking to top of uprush,

S = a coefficient defining particle shape,

σ_Φ = skewness or other parameter defining the size distribution of the sediment,

i_o = initial slope of the beach,

γ' = submerged density of the sediment,

F_* = densimetric Froude number,

R_* = densimetric Reynolds number,

D = characteristic diameter of the sediment,

u = characteristic wave-induced velocity, and

W = fall velocity of the sediment.

At this stage, most investigators who use the dimensional analysis approach neglect some of the terms in equation (14) based on a number of physical arguments, e.g.,

(a) the ratio P/T will be a unique function of the wave characteristics and the equilibrium profile, and can be dropped;

(b) R_* is generally dropped because it cannot be modeled in similitude and it is further argued that the breaker zone is fully turbulent; hence, Reynolds number effects are not scale-dependent;

(c) it is assumed that i_o has little effect on the final equilibrium profile;

(d) the effects of σ_Φ (skewness) and S (shape) are mostly dismissed but it is generally stated that they should be the same in model and prototype; and

(e) u/W is often neglected because it can be argued that W is already included in the sediment characteristics and u is included in the wave characteristics.

The investigators generally concur with points (a) and (b). The initial slope, i_o, is shown later in this report to be important if it is made too steep. A major part of this study has been devoted to the effects of σ_Φ and S on equilibrium profiles. Paul, Kamphuis, and Brebner (1972) incorporated the effects of D_{50}, σ_Φ, and α by defining an equivalent sediment diameter which included these effects. It seems unlikely that such an assumption will always be valid.

Monroe (1969) performed a series of tests comparing a rounded sand (oolite) and an angular quartz sand and found little difference in profile shapes.

Although the applicable fall velocity is often considered as that obtained in still water, the phenomenon in the breaker zone is inherently turbulent in character; Murray (1970) showed that the true fall velocity of very lightweight material can be as much as 30 percent less when measured in a turbulent medium. Since the physical properties of the sediment are directly available, the fall velocity of a sediment particle in the breaker zone has not been reliably established and discretion is necessary in the use of relationships for this parameter obtained under very different flow conditions.

In view of the disadvantages and use of questionable approximations which are inherent in the dimensional analysis approach, a purely empirical approach based on attempts to match gross beach profile measurements, was proposed by Noda (1972).

4. Empirical Modeling Law Based on Beach Profile Similarity.

Noda (1971, 1972) developed a model law based on an empirical fitting of the beach discontinuity distance, β (see Fig. 1).

The basic model requirement is to relate a model sediment density and grain size to the geometric-scale ratios. This is assumed in the form:

$$n_D = f_1(\lambda,\mu) = \lambda^a \mu^b \quad , \tag{15}$$

and

$$n_{q'} = f_2(\lambda,\mu) = \lambda^c \mu^d \quad . \tag{16}$$

After more than 130 experiments using 14 different materials and 22 different grain sizes, Noda found five model profiles with beach discontinuity distances which matched those on five profiles of Watts (1959). The five prototypes were all step-type profiles with sediment sizes of $D_{50} \geq 0.46$ millimeter.

Noda derived the following relationships based on the five matching profiles:

$$n_D n_{\gamma'}^{1.85} = \mu^{0.55} \quad , \tag{17}$$

and

$$\lambda = \mu^{1.32} n_{\gamma'}^{-0.386} \quad , \tag{18}$$

which comprise the basic modeling law to be evaluated by further testing. A nomograph for use of equations (17) and (18) is presented in Figure 5.

5. Comparison of Model Laws.

The theoretical and practical approaches to the development of model laws are considered as coming from two different philosophies. The first is from a desire to reproduce the dominant physical phenomena; the second is from a need to reproduce observed occurrences. Some of the theoretical conditions (eqs. 2 to 13) are satisfied even when practical laws such as given by equations (17) and (18) are used. A summary of the derived model laws based on the various theoretical similitude conditions and a comparison with the empirical practical similitude condition of Noda (1972) are given in Table 1.

III. EXPERIMENTAL DATA

1. Experimental Apparatus and Procedures.

Experimental tests were performed in the wave flume shown in Figure 6. The flume is 105 feet long with a square cross section measuring approximately 4 by 4 feet. The wave generator is a plunger type and the prime power supply is through a silicon-controlled rectifier (SCR) to a 15-horsepower direct-current motor. The control system permits extremely accurate speed control over a wide range of load conditions. The motor is coupled through a 21:1 speed reducer. A range of wave periods from about 0.5 to 6 seconds can be generated. Longer periods are possible with a reduced duty cycle or by a change of speed reducer; however, the extended range was not needed for this study.

To reduce the amount of test material and to obtain larger amplitude waves, a convergence was built to reduce the tank width by half. To further increase the rate of testing, a Plexiglas partition was also introduced parallel to the wave tank to test two materials simultaneously. This latter partition permitted comparisons of different materials under

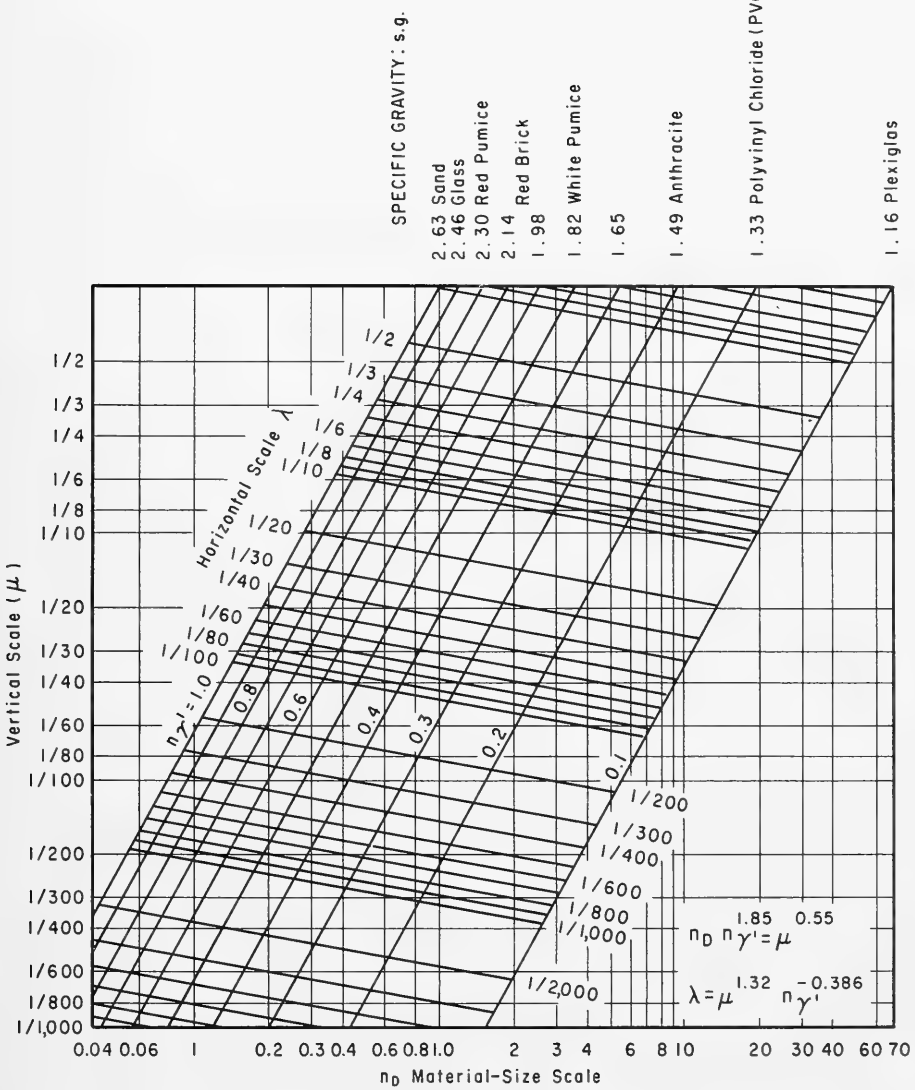

Figure 5. Graphical representation of model law (Noda, 1972).

Table 1. Summary and comparison of model laws.

Case no.	Similitude conditons							Assumed condition	Result when $n_{\gamma'} = n_D = 1$, $n_w = 1$	Coastal movable-bed model laws
	Condition 1 $n_F = 1 \therefore$ $n_u = \mu^{1/2}$ $n_T = \mu^{1/2}$ $n_L = \mu$	Condition 2 $n_{F_*} = 1 \therefore$ $n_\gamma, n_D = n_{u_*}^2$	Condition 3 $n_{R_*} = 1 \therefore$ $n_{u_*} n_D = 1$	Condition 4 Turbulent flow $n_{u_*} = \mu^{1/2} n_{\frac{1}{f}}^{1/2}$	Condition 5 Friction factor $n_{\bar{f}} = \frac{\mu}{\lambda}$	Condition 6 $\frac{n_u}{n_w} = \frac{\lambda}{\mu} \therefore$ $n_w = \frac{\mu^{3/2}}{\lambda}$	Condition 7 Stokes velocity R e ≤ 1 $n_w = n_D^2 n_{\gamma'}$			
1	X	X		X	X	X	X		$\lambda \equiv 1$, $\mu \equiv 1 \therefore$ using prototype materials a model is not valid	$n_D = \frac{1}{\mu^{1/2}}$, $n_{\gamma'} = \frac{\mu^{5/2}}{\gamma}$, $n_{u_*} = \frac{\mu}{\lambda^{1/2}}$
2	X	X		X		X	X	$n_{\bar{f}} = \frac{\mu^m}{\lambda^n}$	$\lambda = \mu^{3/2}$ m = 1 n = 2	$n_D = \frac{\lambda}{\mu^{1/2}}$, $n_{\gamma'} = \frac{\mu^{5/2}}{\lambda^3}$, $n_{\bar{f}} = \frac{\mu}{\lambda^2}$, $n_{\gamma'} n_D^3 = \mu$, $n_{u_*} = \frac{\mu^{3/2}}{\lambda}$
3	X	X				X	X	$n_{u_*} = \frac{\mu^p}{\lambda^q}$	$\lambda = \mu^{3/2}$ p = 3 q = 2	$n_D = \lambda^3 \mu^{-9/2}$, $n_{\gamma'} = \mu^{21/2} \lambda^{-7}$, $n_{\gamma'} n_D^{7/3} = 1$, $n_{u_*} = \frac{\mu^3}{\lambda^2}$, $\lambda = n_D^{1/3} \mu^{3/2}$
4	X							Match bar	$\lambda = \mu^{1.32}$	$n_D n_{\gamma'}^{1.85} = \mu^{0.55}$ $\lambda = \mu^{1.32} n_{\gamma'}^{-0.386}$

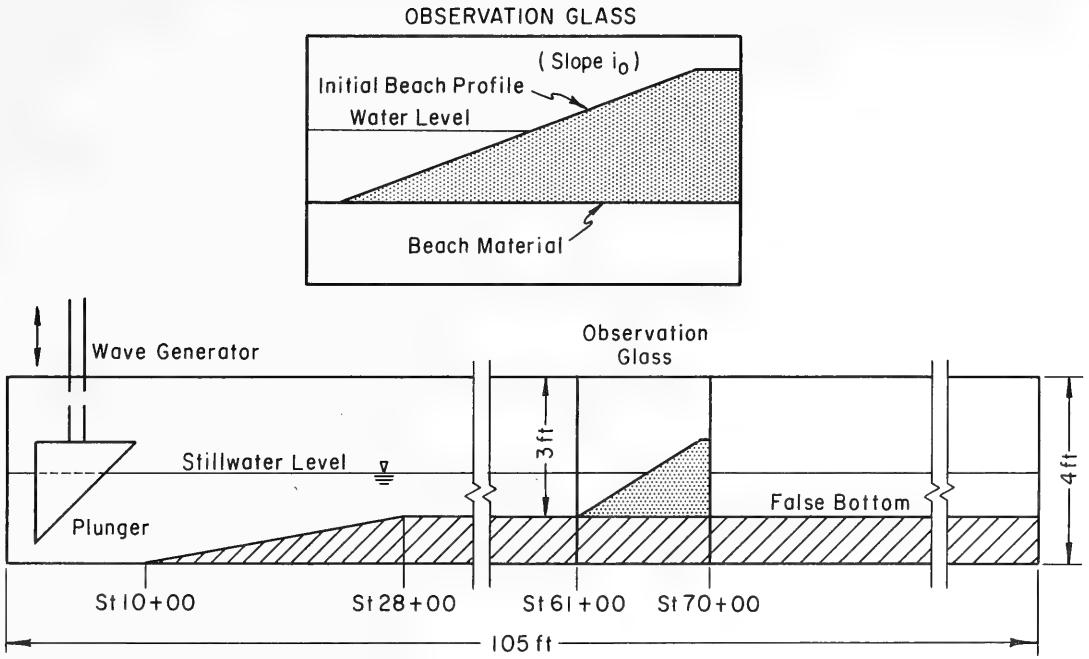

Figure 6. Diagram of wave tank used in this study (Tetra Tech, Inc.).

identical wave conditions during the tests. Therefore, the test widths of the slopes reported in this study are approximately 1 foot wide.

The wave height and profile elevations were measured in centimeters with a point gage mounted on an overhead trolley. Horizontal measurements were made in feet.

The wave height was determined by searching for a maximum and minimum height ahead of the beach. These occur one-half wavelength apart. The incident wave is the mean of the measurements and the reflected wave is one-half of the difference.

Profiles were taken initially and after reaching equilibrium (or close to equilibrium). Equilibrium was determined by periodically placing tape on the glass wall along the profile and continuing the runs until no further change occurred. Equilibrium was reached in most tests after 23 or 24 hours. Intermediate profile surveys were taken after 1 and 5 hours for most of the experiments. Water temperatures were monitored and recorded.

It was difficult to isolate the effects of size distribution and particle shape with the practical materials available. The materials used in the experimental program were quartz sand, glass, polyvinyl chloride (PVC), pumice, and "rocklite."

2. Results.

The conditions for all the tests are given in Table 2.

Table 3 summarizes the experiments by purpose. Tabulated data on all profiles are given in Appendix B; plots of the profiles are in Appendix C.

IV. DISCUSSION OF RESULTS

1. Effects of Size Distribution.

Comparative tests were made with materials having equal median diameters but different size distributions (Table 4). Tests 11B and 12B repeat the conditions of tests 5B and 6B, but with the materials crossed over between the two subdivided channels. The results of this comparison, as an indication of possible channel effects, are discussed later.

Selected pairs from Table 4 are shown as Figures 7 to 14. Little difference was found in most profiles; however, profiles with sediment having the bimodal distributions show marked differences.

Figures 7, 8, and 14 show that the size distribution does not play a major part in determining beach profiles. However, Figures 9 to 13 show profiles comparing equilibrium profiles obtained with a bimodal and a

Table 2. Summary log of test runs.

Test Run	h	Temp. (°F)	Gamma (γ_s)[1]	Particle diameter (mm)[2]	Wave height (m)	Water depth (cm)	Wave period (s)	Wave steepness (H_o/L_o)	Sediment description (Particle shape)[3]
1-Noda[4]		65.0	2.67	1.58	4.300E-02	22.2	1.00	3.011E-02	No. 12 sand, D_{50} = 1.58mm
2-Noda		65.0	2.67	0.560	4.300E-02	22.2	1.00	3.011E-02	IC sand, D_{50} = 0.56mm
3-Noda		65.0	2.67	1.58	4.300E-02	22.2	1.00	3.011E-02	No. 12 sand, D_{50} = 1.58mm
4-Noda		65.0	2.67	0.560	4.300E-02	22.2	1.00	3.011E-02	IC sand, D_{50} = 0.56mm
5-Noda		65.0	2.67	1.58	4.300E-02	22.2	1.00	3.011E-02	No. 12 sand, D_{50} = 1.58mm
6-Noda		65.0	2.67	0.560	3.900E-02	22.2	1.54	1.054E-02	IC sand, D_{50} = 0.56mm
7-Noda		65.0	2.67	1.58	3.900E-02	22.2	1.54	1.054E-02	No. 12 sand, D_{50} = 1.58mm
8-Noda		65.0	2.67	0.560	4.300E-02	22.2	1.00	3.011E-02	IC sand, D_{50} = 0.56mm
9-Noda		65.0	2.67	0.500	4.300E-02	22.2	1.00	3.011E-02	Uniform sand, 0.42 < D_{50} < 0.59
10-Noda		65.0	2.67	0.500	4.300E-02	22.2	1.00	3.011E-02	Uniform sand, 0.42 < D_{50} < 0.59
11-Noda		65.0	2.67	0.560	4.300E-02	22.2	1.00	3.011E-02	IC sand, D_{50} = 0.56mm
12-Noda		65.0	2.67	0.500	4.300E-02	22.2	1.00	3.011E-02	Uniform sand, 0.42 < D_{50} < 0.59
13-Noda		65.0	2.67	0.500	3.900E-02	22.2	1.54	1.054E-02	Unifrom sand, 0.42 < D_{50} < 0.59
14-Noda		65.0	2.67	0.560	3.900E-02	22.2	1.54	1.054E-02	IC sand, D_{50} = 0.56mm
15-Noda		65.0	2.67	0.260	4.300E-02	22.2	1.00	3.011E-02	Uniform sand, 0.21 < D_{50} < 0.30
16-Noda		65.0	2.67	0.260	4.300E-02	22.2	1.00	3.011E-02	Fine sand, D_{50} = 0.26mm
17-Noda		65.0	2.67	0.260	3.900E-02	22.2	1.54	1.054E-02	Uniform sand, 0.21 < D_{50} < 0.30
18-Noda		65.0	2.67	0.260	3.900E-02	22.2	1.54	1.054E-02	Fine sand, D_{50} = 0.26mm
3A	24	63.5	2.42	0.500	4.300E-02	34.2	1.00	3.011E-02	Glass beads
4A	24	63.5	2.42	0.600	4.300E-02	34.2	1.00	3.011E-02	Ground medium glass
5A	19	63.5	2.42	0.600	4.000E-02	34.2	1.54	1.162E-02	Ground medium glass
6A	19	63.5	2.42	0.500	4.000E-02	34.2	1.54	1.162E-02	Glass beads
7A	15	61.0	2.42	0.600	5.600E-02	34.4	1.54	1.621E-02	Ground medium glass
8A	15	61.0	2.42	0.500	5.600E-02	34.4	1.54	1.621E-02	Glass beads
9A	26	61.0	2.42	0.600	7.300E-02	34.4	1.54	2.108E-02	Ground medium glass
10A	26	61.0	2.42	0.500	7.300E-02	34.4	1.54	2.108E-02	Glass beads
11A	5	62.0	2.42	0.300	1.000E-02	32.2	0.820	1.049E-02	Glass beads
12A	5	62.0	2.42	0.300	1.000E-02	32.2	0.820	1.049E-02	Ground small glass
13A	23	62.0	2.42	0.300	2.000E-02	32.2	0.820	2.002E-02	Glass beads
14A	23	62.0	2.42	0.300	2.000E-02	32.2	0.820	2.002E-02	Ground small glass
15A	23	62.0	1.30	3.10	1.500E-02	32.4	0.970	1.090E-02	PVC cylinders
16A	23	62.0	1.30	2.90	1.500E-02	32.4	0.970	1.090E-02	Crushed PVC
17A	22	63.0	1.30	3.10	3.400E-02	32.3	0.970	2.520E-02	PVC cylinders
18A	22	63.0	1.30	2.90	3.400E-02	32.3	0.970	2.520E-02	Crushed PVC
19A	29	63.0	1.30	3.10	4.200E-02	32.3	0.970	3.065E-02	PVC cylinders
20A	29	63.0	1.30	2.90	4.200E-02	32.3	0.970	3.065E-02	Crushed PVC
21A	5	63.0	2.42	0.300	7.400E-02	31.2	1.54	2.108E-02	Glass beads
22A	5	63.0	2.42	0.300	7.400E-02	31.2	1.54	2.108E-02	Ground small glass
23A	23	68.0	1.30	1.20	5.600E-02	31.0	3.54	2.199E-03	Rocklite
24A	23	68.0	1.60	0.800	5.600E-02	31.0	3.54	2.199E-03	Pumice
25A	23	68.0	1.30	1.20	3.400E-02	32.5	2.58	2.888E-03	Rocklite
26A	23	68.0	1.60	0.800	3.400E-02	32.5	2.58	2.888E-03	Pumice
1B	15	65.0	2.42	0.620	4.100E-02	30.7	1.00	2.883E-02	Two fine, one coarse, ground glass
2B	15	65.0	2.42	0.620	4.100E-02	30.7	1.00	2.883E-02	Ground medium glass
3B	24	65.0	2.42	0.620	4.900E-02	30.7	1.54	1.405E-02	Two fine, one coarse, ground glass
4B	24	65.0	2.42	0.620	4.900E-02	30.7	1.54	1.405E-02	Ground medium glass
5B	24	67.0	2.42	0.620	7.500E-02	30.8	1.54	2.135E-02	Two fine, one coarse, ground glass
6B	24	67.0	2.42	0.620	7.500E-02	30.8	1.54	2.135E-02	Ground medium glass
7B	22	67.0	2.42	0.620	7.900E-02	30.8	1.00	5.509E-02	Two fine, one coarse, ground glass
8B	23	67.0	2.42	0.620	7.900E-02	30.8	1.00	5.509E-02	Ground medium glass
9B	24	67.0	2.42	0.620	7.100E-02	30.8	1.26	3.107E-02	Two fine, one coarse, ground glass
10B	24	67.0	2.42	0.620	7.400E-02	30.8	1.26	3.107E-02	Ground medium glass
11B	24	67.0	2.42	0.620	7.000E-02	30.8	1.54	1.999E-02	Ground medium glass
12B	24	67.0	2.42	0.620	7.000E-02	30.8	1.54	1.999E-02	Two fine, one coarse, ground glass
13B	24	67.0	2.42	0.620	7.000E-02	30.8	1.54	1.999E-02	Ground medium glass
14B	24	67.0	2.42	0.620	7.000E-02	30.8	1.54	1.999E-02	Two fine, one coarse, two medium, ground glass
15B	24	65.0	2.42	0.600	4.000E-02	30.8	1.00	2.819E-02	Ground medium glass
16B	24	65.0	2.42	0.600	4.000E-02	30.8	1.00	2.819E-02	Two fine, one coarse, two medium, ground glass
17B	24	65.0	2.42	0.450	7.000E-02	30.8	1.54	1.999E-02	One fine, one medium, ground glass
18B	24	65.0	2.42	0.450	7.000E-02	30.8	1.54	1.999E-02	One fine, one medium, ground glass
19B	24	65.0	2.42	0.450	4.300E-02	30.8	1.00	3.011E-02	One fine, one medium, glass beads
20B	24	65.0	2.42	0.450	4.300E-02	30.8	1.00	3.011E-02	One fine, one medium, ground glass
21B	24	65.0	2.42	0.450	4.300E-02	30.8	1.54	1.216E-02	One fine, one medium, glass beads
22B	26	65.0	2.42	0.450	4.300E-02	30.8	1.54	1.216E-02	One fine, one medium, ground glass
23B	26	65.0	2.42	0.450	7.000E-02	30.8	1.00	4.869E-02	One fine, one medium, glass beads
24B	26	65.0	2.42	0.450	7.000E-02	30.8	1.00	4.869E-02	One fine, one medium, ground glass
25B	24	65.0	1.30	3.50	4.200E-02	30.8	1.00	2.947E-02	Green, one gray, PVC cubes
26B	24	65.0	1.30	2.45	4.200E-02	30.8	1.00	2.947E-02	One black, one white, PVC cylinders
1C	24	65.0	1.30	1.20	0.116	27.0	4.30	3.084E-03	Rocklite
2C	24	65.0	1.60	0.800	0.116	27.0	4.30	3.084E-03	Pumice
3C	28	65.0	1.30	1.20	0.121	30.4	3.03	6.978E-03	Rocklite
4C	28	65.0	1.60	0.800	0.121	30.4	3.03	6.978E-03	Pumice
5C	24	65.0	1.30	1.20	7.000E-02	30.4	2.60	5.781E-03	Rocklite
6C	24	65.0	1.60	0.800	7.000E-02	30.4	2.60	5.781E-03	Pumice
7C	26	65.0	1.30	1.20	0.100	30.4	2.75	7.285E-03	Rocklite
8C	26	65.0	1.60	0.800	0.100	30.4	2.75	7.285E-03	Pumice
9C	24	65.0	1.30	1.20	8.000E-02	30.5	2.46	7.622E-03	Rocklite
10C	24	65.0	1.60	0.800	8.000E-02	30.5	2.46	7.622E-03	Pumice
11C	24	65.0	1.30	1.20	8.200E-02	30.5	2.60	6.823E-03	Rocklite
12C	24	65.0	1.60	0.800	8.200E-02	30.5	2.60	6.823E-03	Pumice
13C	24	65.0	1.30	1.20	5.900E-02	30.5	2.20	7.280E-03	Rocklite
14C	24	65.0	1.60	0.800	5.900E-02	30.5	2.20	7.280E-03	Pumice
15C	24	65.0	1.30	1.20	5.200E-02	32.7	4.28	1.294E-03	Rocklite
16C	24	65.0	1.60	0.800	5.200E-02	32.7	4.28	1.294E-03	Pumice
17C	24	65.0	1.30	1.20	4.100E-02	24.8	3.70	1.404E-03	Rocklite
18C	24	65.0	1.60	0.800	4.100E-02	24.8	3.70	1.404E-03	Pumice

[1]Sediment specific weight.
[2]Median grain size.
[3]Details in Appendix A.
[4]Tests performed by Noda in 1972-73.

Table 2 notes.

(a) The first column indicates the run code number and the number of hours duration for that test,

(b) temperature is water temperature in °F,

(c) gamma is γ_s, the sediment specific weight,

(d) particle diameter is the median grain size in millimeters,

(e) wave height is in meters,

(f) water depth is in centimeters,

(g) wave period is in seconds,

(h) wave steepness is H_o/L_o (deep water),

(i) particle shapes describes the material, further details are given in Appendix A.

Table 3. Summary of experiments.

Test	Purpose	Material
1 to 7	Preliminary experiments	Quartz sand
8 to 18	Size distribution	Quartz sand
3A to 14A	Shape	Glass
15A to 20A	Shape and size distribution	PVC
21A to 22A	Shape	Glass
23A to 26A	Material evaluation	Rocklite and pumice
1B to 16B	Size distribution	Glass
17B to 24B	Shape	Glass
25B to 26B	Shape	PVC
1C to 18C	Verification	Rocklite and pumice

Table 4. Effects of size distribution on profile shape: identification of comparative tests.

Test pairs	Remarks
(9, 10, 12) and (8, 11)	Natural sand; D_{50} = 0.56mm vs.
13 and 14	nos. 30 to 40 sieve size.
15 and 16	Natural sand; D_{50} = 0.26mm vs.
17 and 18	nos. 50 to 70 sieve size.
15A and 16A	Crushed PVC well distributed vs.
17A and 18A	uniform PVC cylinders.
19A and 20A	
1B and 2B	Biomodal ground glass having same
3B and 4B	average diameter vs. unimodal
5B and 6B	ground glass.
7B and 8B	
9B and 10B	
11B and 12B	Repeat of 5B and 6B with materials reversed.
13B and 14B	Trimodal ground glass vs. unimodal.
15B and 16B	

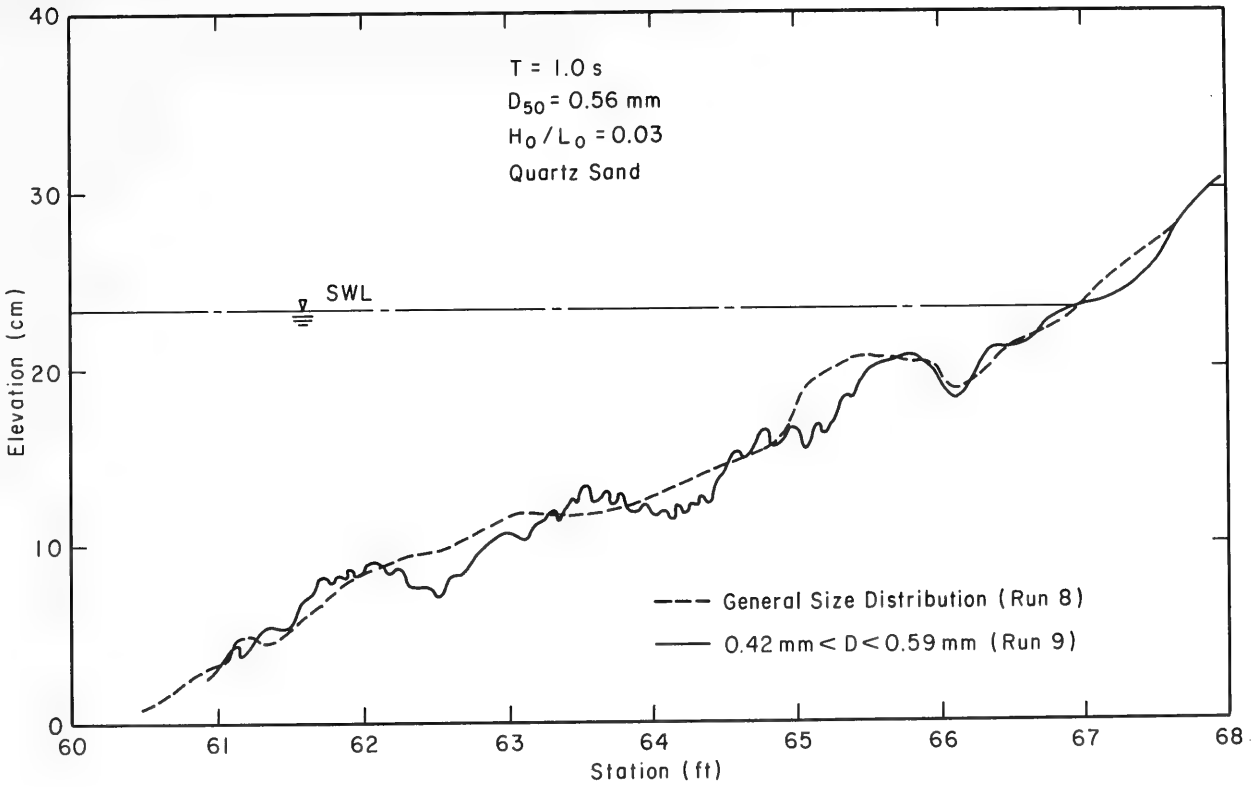

Figure 7. Comparison of beach profiles obtained with sand having graded and narrow size distributions.

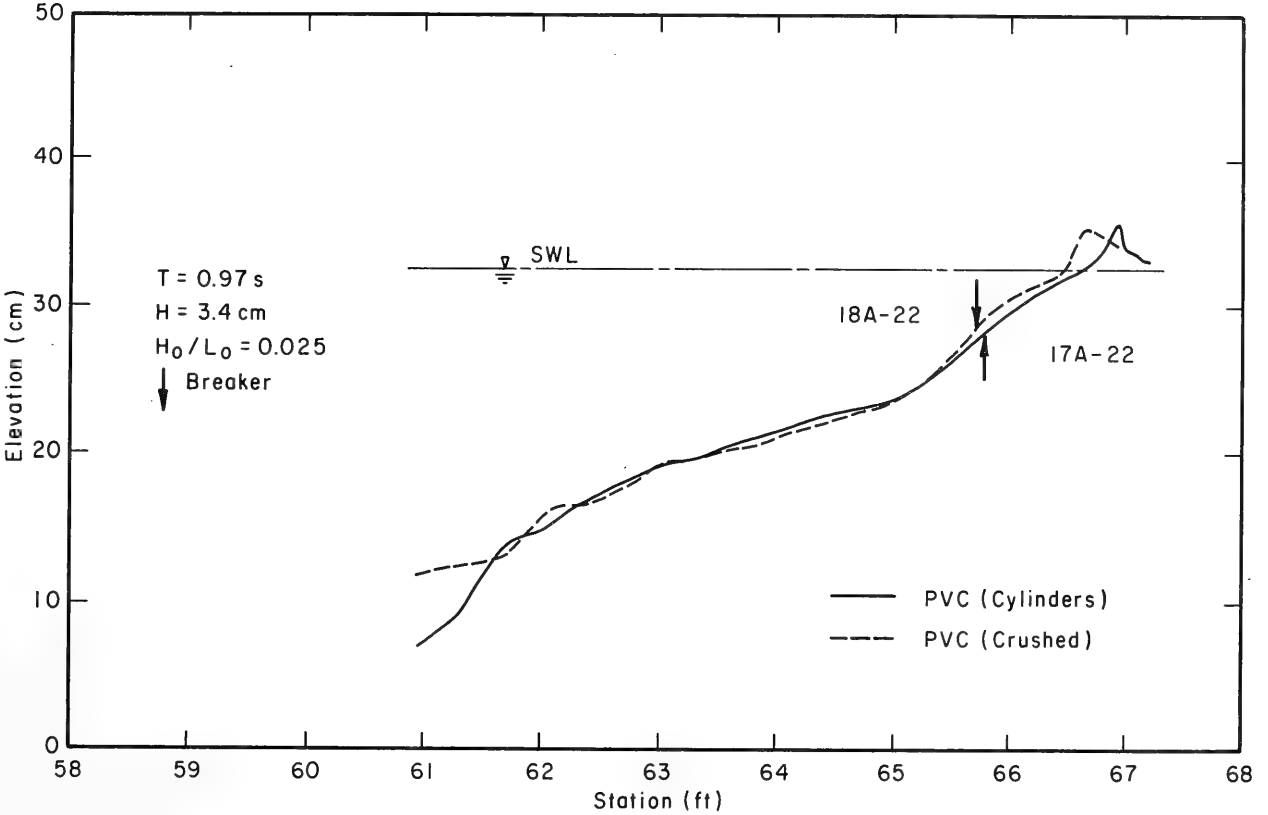

Figure 8. Typical example of the comparison of beach profiles using crushed PVC and PVC cylinders.

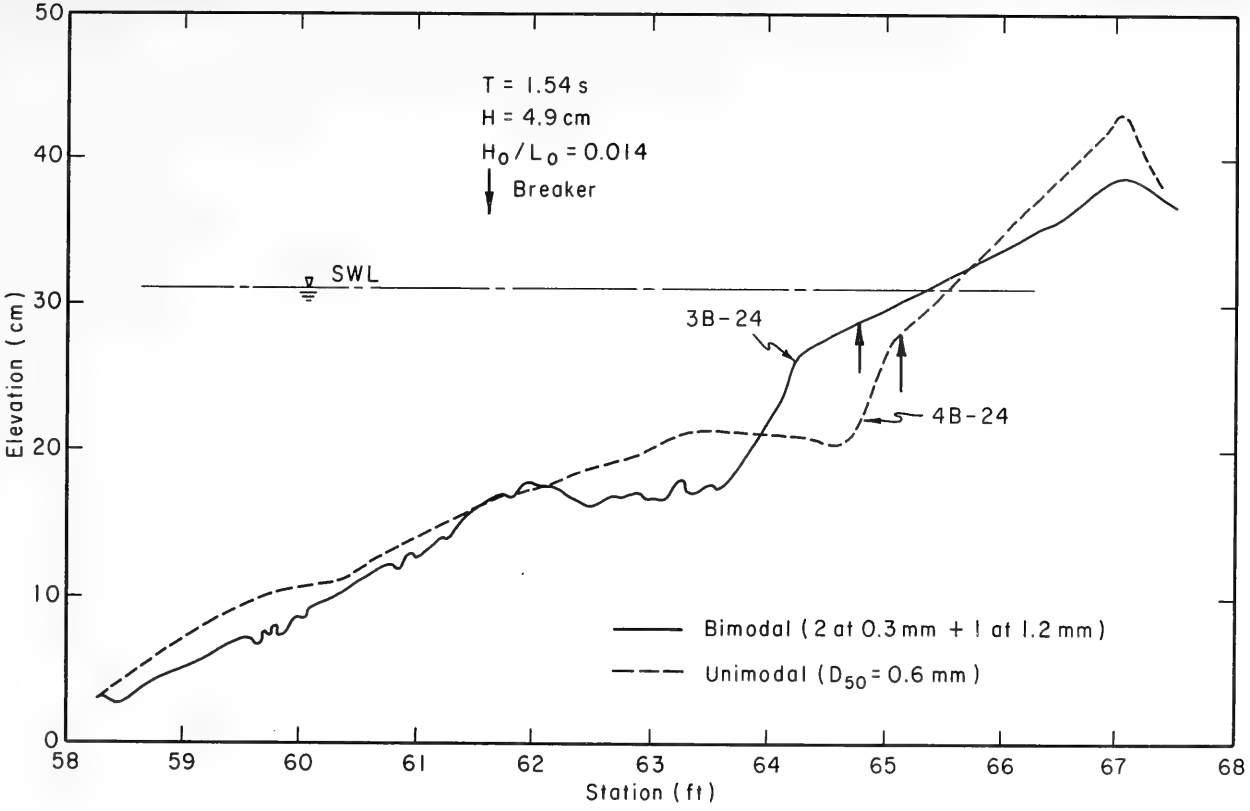

Figure 9. Comparison of beach profiles obtained with unimodal and bimodal sediment distribution having the same median diameter (H_o/L_o = 0.014).

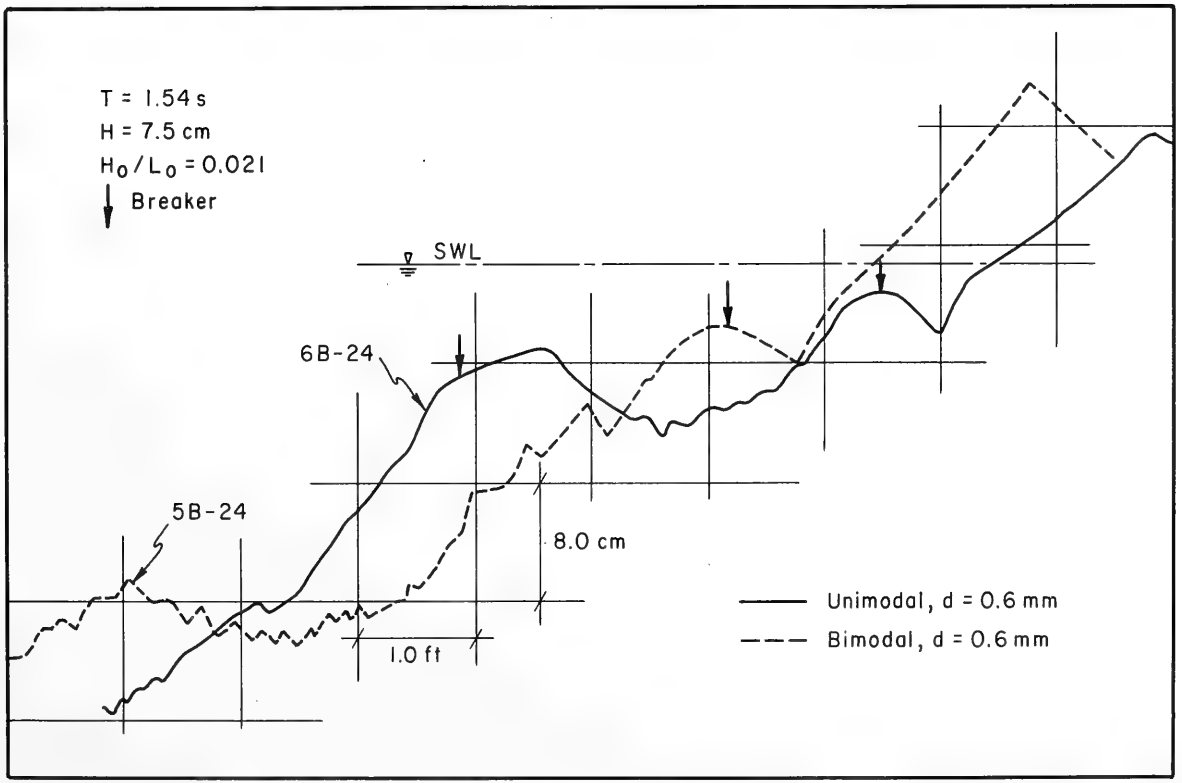

Figure 10. Comparison of beach profiles obtained with unimodal and bimodal sediment distribution having the same median diameter (H_o/L_o = 0.021).

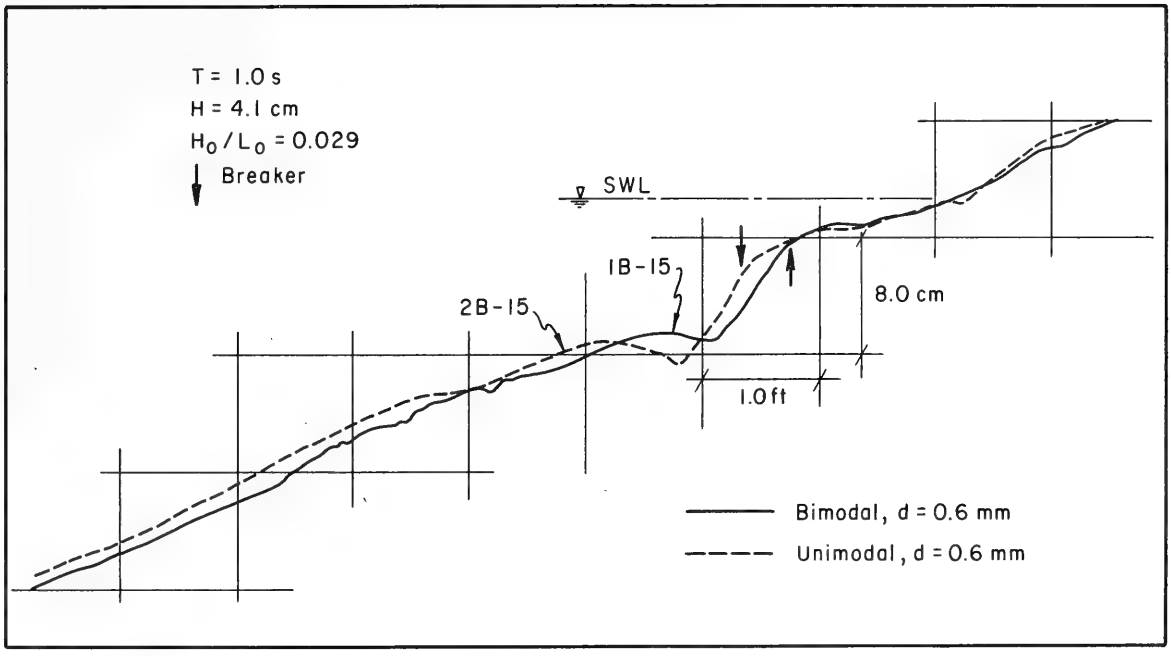

Figure 11. Comparison of beach profiles obtained with unimodal and bimodal sediment distribution having the same median diameter (H_o/L_o = 0.029).

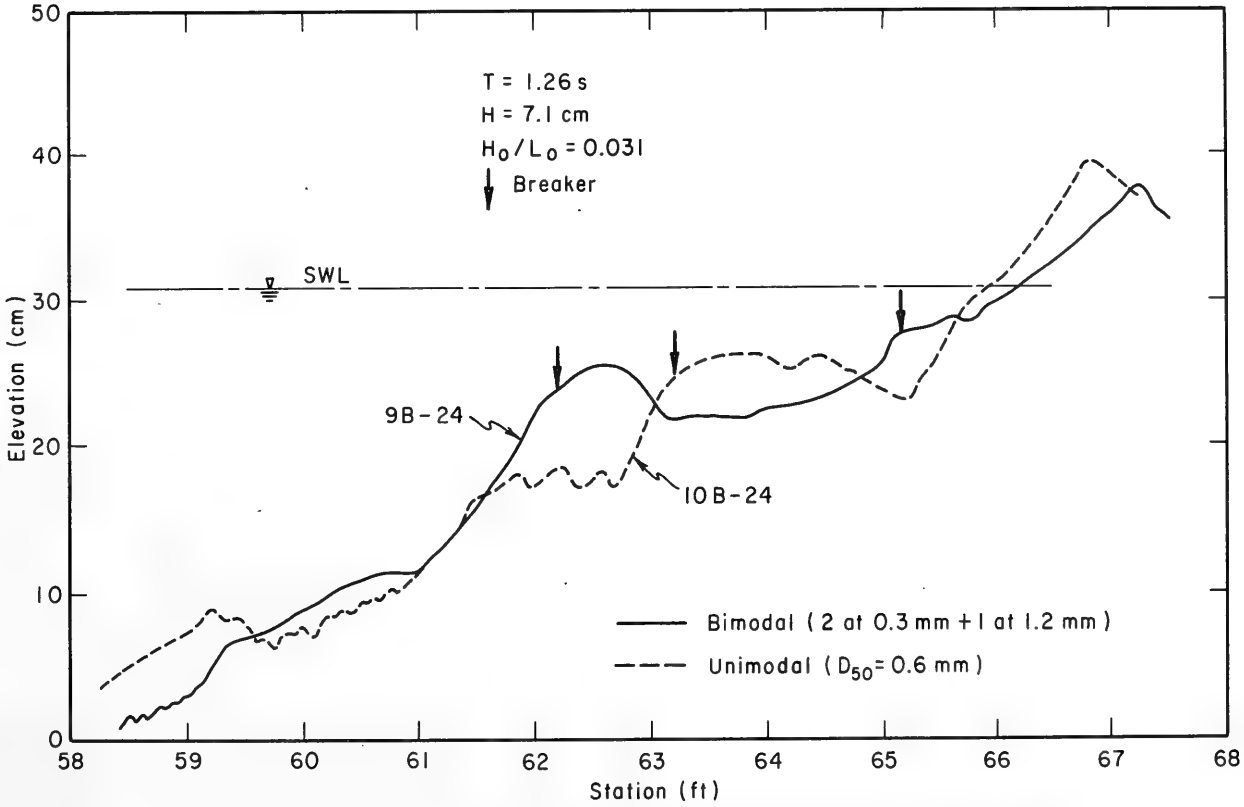

Figure 12. Comparison of beach profiles obtained with unimodal and bimodal sediment distribution having the same median diameter (H_o/L_o = 0.031).

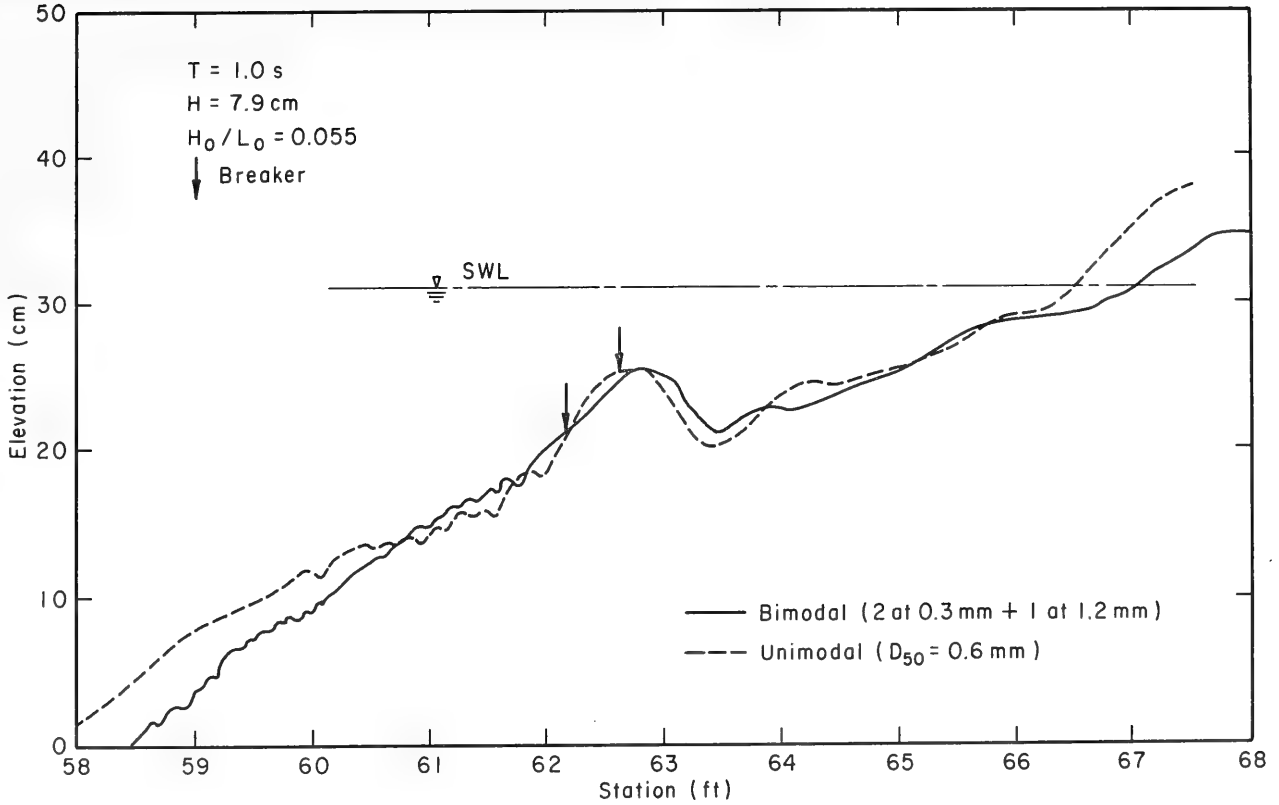

Figure 13. Comparison of beach profiles obtained with unimodal and bimodal sediment distribution having the same median diameter (H_o/L_o = 0.055).

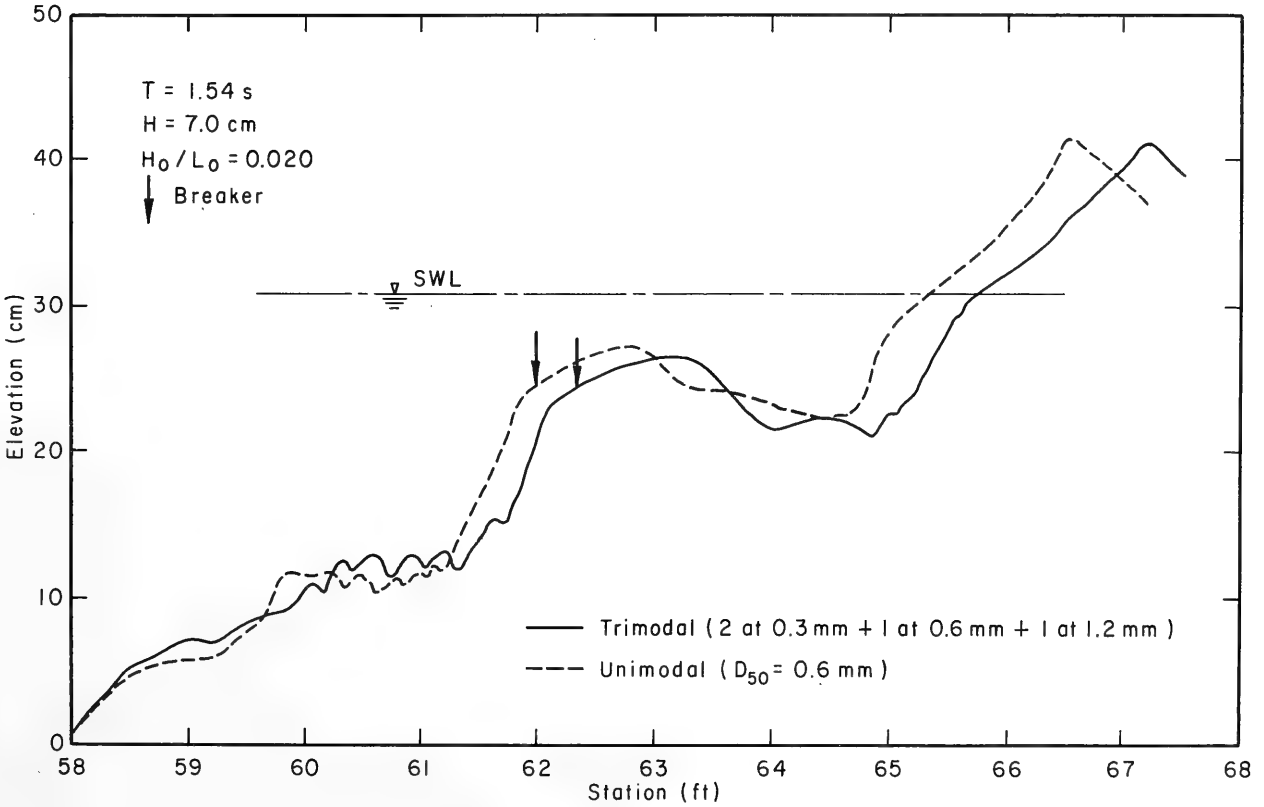

Figure 14. Comparison of beach profiles obtained with unimodal and trimodal sediment distribution having the same median diameter (H_o/L_o = 0.020).

unimodal (but narrow) sediment-size distribution. The figures are arranged in ascending order of wave steepness. The smallest steepness tested (H_o/L_o = 0.014) shows a tendency for a bar formation in tests with bimodal and unimodal distributions (Fig. 9); however, in tests with a bimodal distribution, the bar is formed farther offshore. The slope of the beach face is also different. For a steeper wave with the same period, Figure 10 shows the bar formations even farther apart than those shown in Figure 9. However, Figure 11 shows similar profiles for a wave steepness (H_o/L_o = 0.029) lying between that of Figure 10 (H_o/L_o = 0.021) and Figure 12 (H_o/L_o = 0.031). This apparent contradiction can only be explained by the difference in wave height (4 centimeters versus 7 or 8 centimeters). For waves of very large steepness (H_o/L_o > 0.05), the differences between bimodal and unimodal distributions diminish (Fig. 13). Finally, it was found that the trimodal grain-size distributions tested always produced profiles similar to those of unimodal distributions (Fig. 14).

An apparent consistent difference between a uniform-sized sand and a sand with broader size distribution is that the uniform sand tends to form more ripples. Another phenomenon was noticed for some wave conditions, where the uniform sand size produced an unstable equilibrium profile which oscillated between two extreme profiles: one with a bar and one without. This phenomenon appeared again in tests which compare the effect of grain shape.

2. Effects of Grain Shape.

Pairs of tests performed to determine the effects of grain shape are summarized in Table 5. Examples of beach profiles using selected pairs of runs are shown in Figures 15 to 18 (profiles have been shifted horizontally to superpose the SWL intercepts; see Appendix B for actual positions). In most tests the effect of shape was represented more by Figures 16 and 18 than Figures 15 and 17. The different PVC shapes, the smallest glass sizes (D_{50} = 0.3 millimeter), and most of the graded mixes seemed to produce similar profiles independent of grain shape. However, some exceptions occurred as shown in Figures 15 and 17. Other pairs (not shown in the figures) which illustrated similar phenomena only occurred with the larger glass sizes (D_{50} =0.6 millimeter) and mixtures having larger glass sizes, and then only for relatively small-wave steepnesses. The profile differences appear to be related to some instability associated with the formation of a bar. This phenomenon, shown in Figure 9, has also been observed for sand having a very uniform grain size.

The phenomenon appears to follow the sequence:

(a) Waves breaking on the beach slope (Fig. 19, a) causes scour just inshore of the breaker and the scoured material is deposited on the beach face and the bar (Fig. 19, b);

(b) the bar continues to build (Fig. 19, c) until of sufficient size to move the breaker point offshore of the bar (4 to 5 hours in this particular test);

Table 5. Effects of particle shape on profile shape: identification of comparative tests.

Test pairs	Remarks
3A and 4A 5A and 6A 7A and 8A 9A and 10A	Glass beads vs. ground glass; D_{50} = 0.6mm.
11A and 12A 13A and 14A 21A and 22A	Glass beads vs. ground glass; D_{50} = 0.2mm.
15A and 16A 17A and 18A 19A and 20A	Crushed PVC vs. PVC cylinder; D_{50} = 2.9mm.
17B and 18B 19B and 20B 21B and 22B 23B and 24B	Glass bead mixture vs. ground glass mixture.
25B and 26B	PVC cubes vs. PVC cylinders.

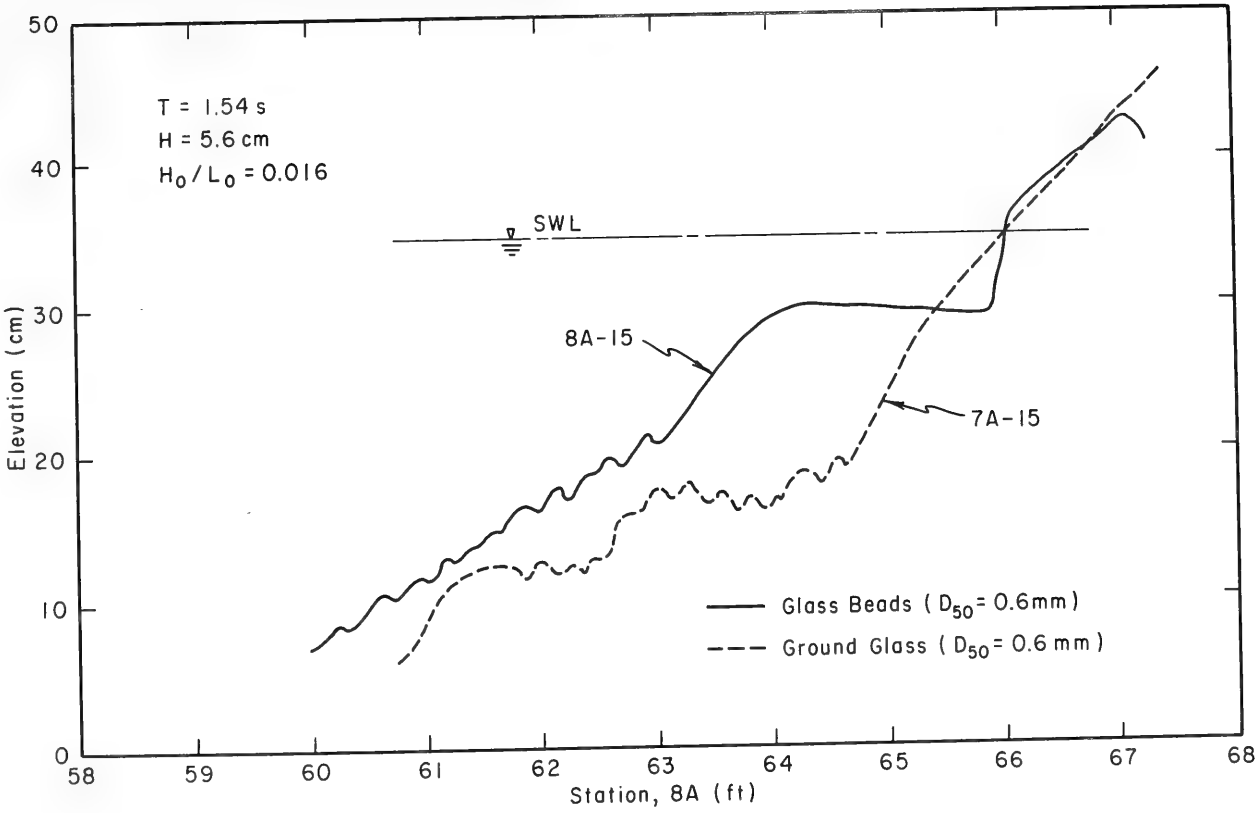

Figure 15. Comparison of beach profiles showing effect of grain shape for glass beads and ground glass (H_o/L_o = 0.016).

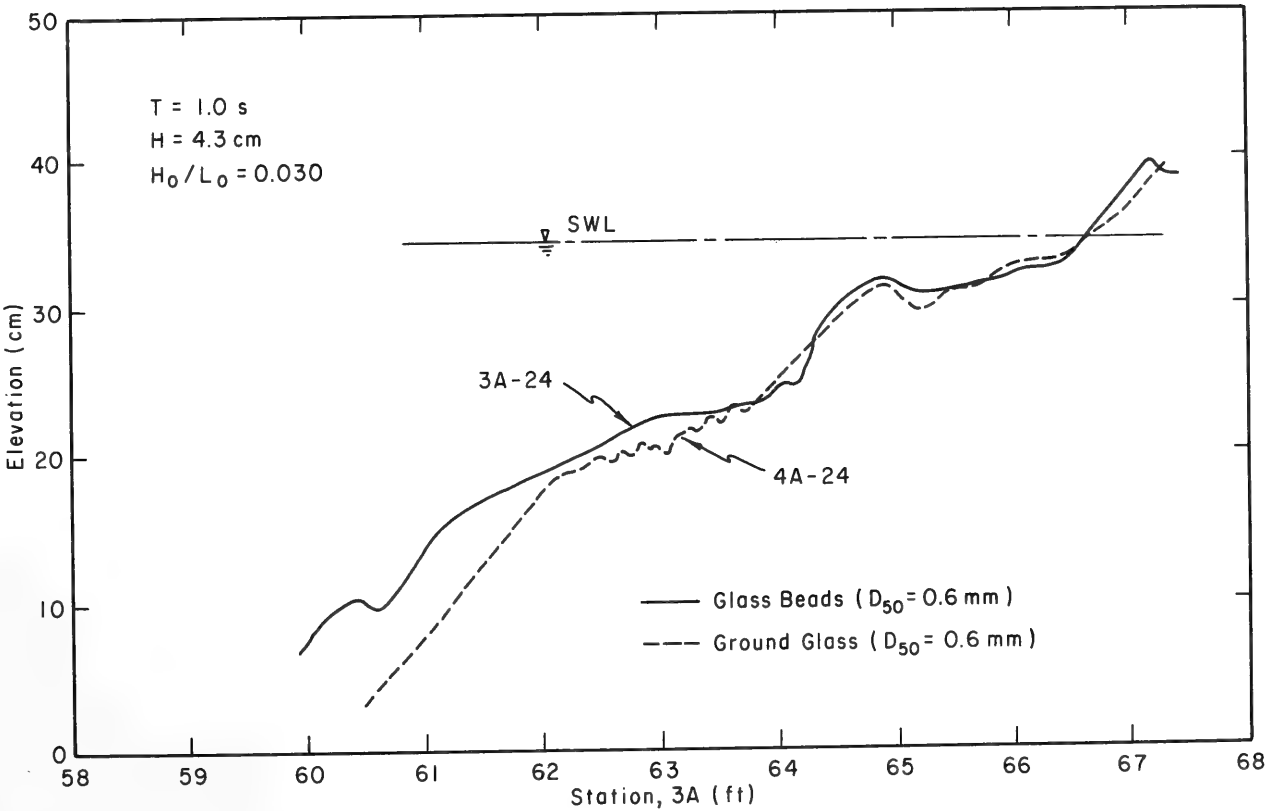

Figure 16. Comparison of beach profiles showing effect of grain shape for glass beads and ground glass (H_o/L_o = 0.030).

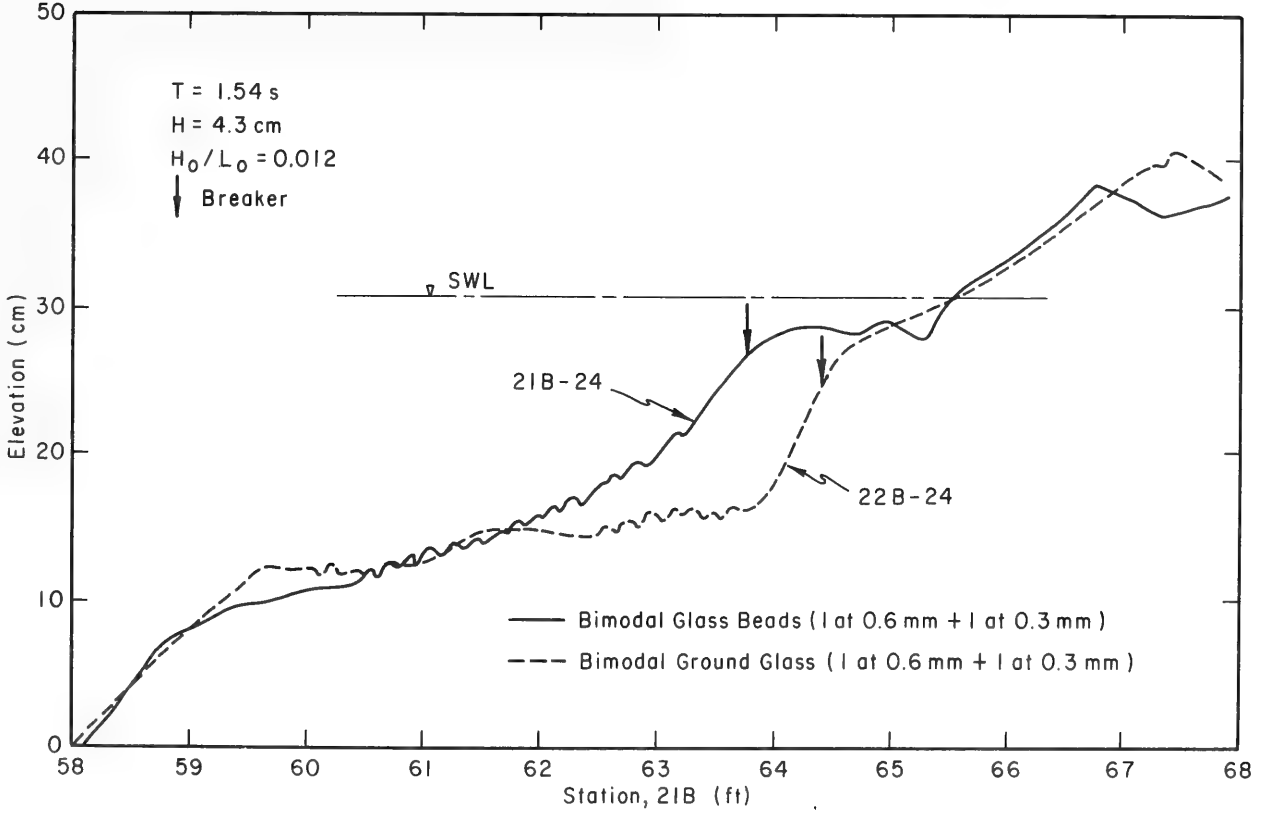

Figure 17. Comparison of beach profiles as influenced by grain shape difference for mixed sizes (H_o/L_o = 0.012).

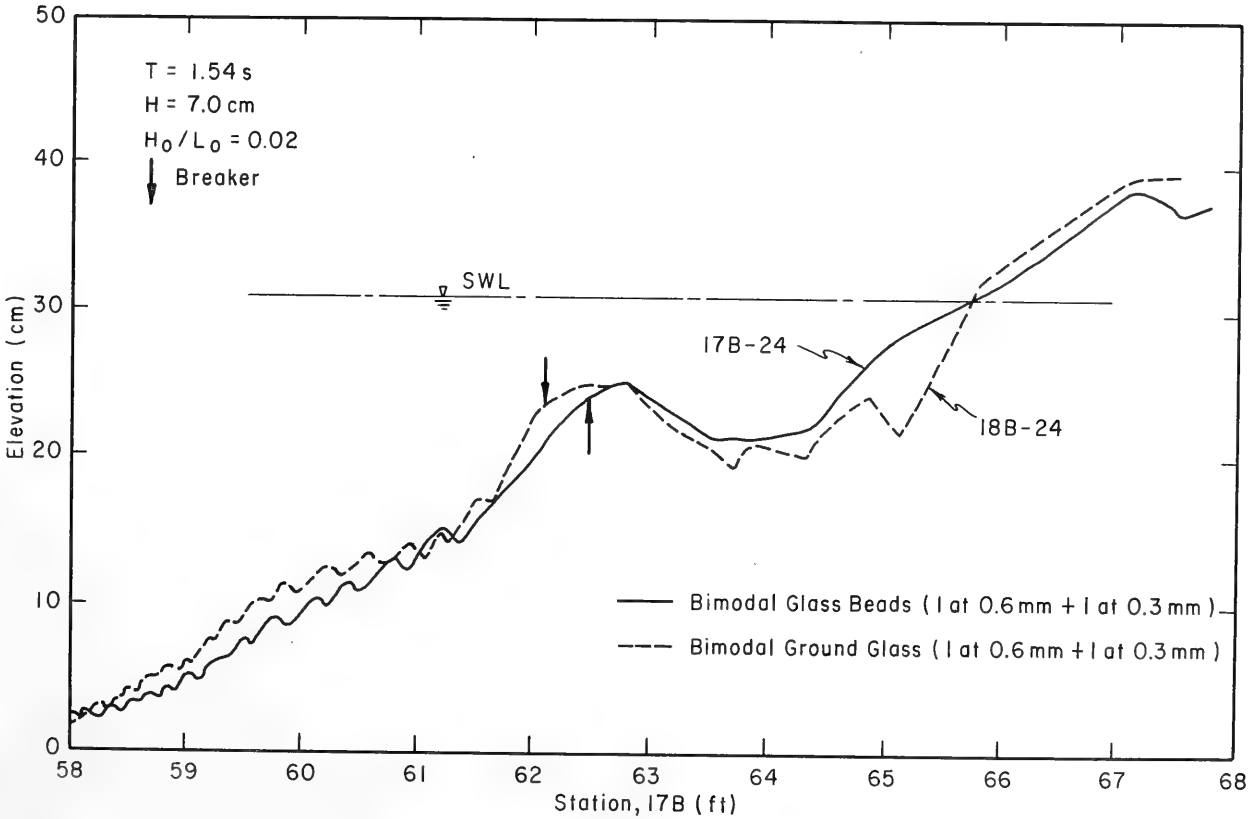

Figure 18. Comparison of beach profiles as influenced by grain shape difference for mixed sizes (H_o/L_o = 0.02).

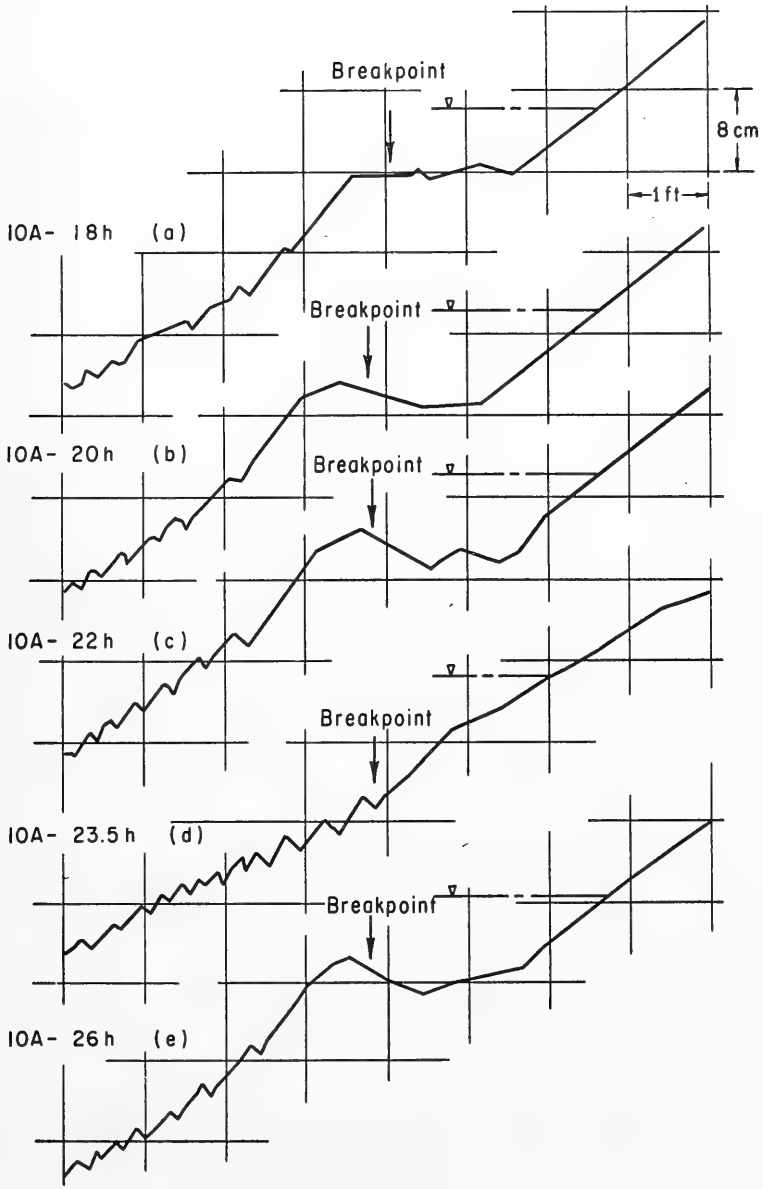

Figure 19. Sequence of profiles illustrating instability.

(c) after the wave breaks offshore of the bar, the bar is quickly scoured (Fig. 19, d) and the beach profile subsequently returns to that of Figures 19, b or 19, e and the breaker location returns closer to shore (about 1 hour and then the cycle repeats).

The apparent instability occurs with beach profiles developed using uniform (periodic) waves, a uniform grain size, or smooth, spherical grain shapes. The appearance of this phenomenon when only the grain shape is different occurs less frequently.

3. Effects of Channel (Test Repeatability).

Laboratory effects are the undesired differences between laboratory and prototype conditions caused by physical conditions unique to the laboratory, and would include such conditions as wave paddle to beach face distance, left- or right-hand channel, effect of channel side and bottom convergence, and the effect of finite water depth at the toe of the beach.

Initially, the hydrodynamics of the surf zone in the presence of a movable bed were thought to be unique; hence, the equilibrium beach obtained would be independent of the initial beach profile. However, the profile shape ahead of the point at which sediment moves was found to affect the wave, the breaker characteristics, and the resultant profile (Fig. 20).

An indication of laboratory effects can be derived from a cross-comparison of several runs. Test repeatability was checked at intervals since a "control" sediment was used in several of the shape and distribution tests. Comparisons of such tests are shown in Figures 21, 22, and 23. Some apparent differences are present but the general beach profiles show some repeatable characteristics, e.g., in all profiles the beach face has the same slope. Some laboratory effects are believed to be present, but the profile differences due to other phenomena (see Figs. 7 to 18) are not masked by the laboratory effects.

The position of the bar varied considerably under nearly identical wave conditions (Figs. 21 and 22). Noda's (1971, 1972) model law was based upon the horizontal distance from the SWL intercept to certain profile features, e.g., the bar. Modeling that distance (if not repeatable) is not easily achieved. Noda's law and most other profile modeling laws are based upon reproducing an equilibrium profile. If the shape of the stable (unchanging) profile which developed for a test series with identical wave conditions is not repeatable, then the concept of equilibrium must be qualified, and all modeling laws based upon the usual equilibrium assumptions are open to question.

These few tests are not sufficient to prove or disprove the concept of profile equilibrium. However, the lack of repeatability suggests that the concept of equilibrium should be reevaluated.

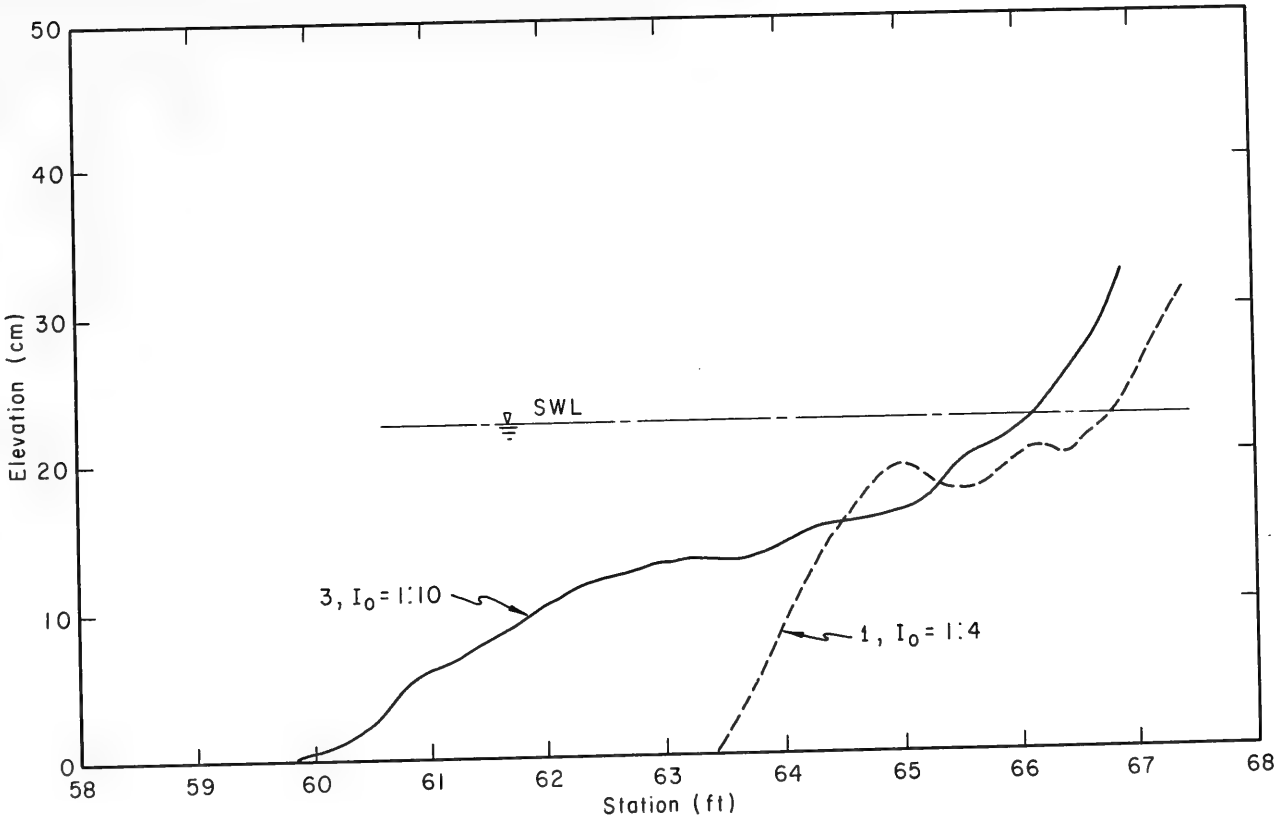

Figure 20. Comparison of equilibrium profiles attained with different initial slopes (sand, D_{50} = 0.56 mm).

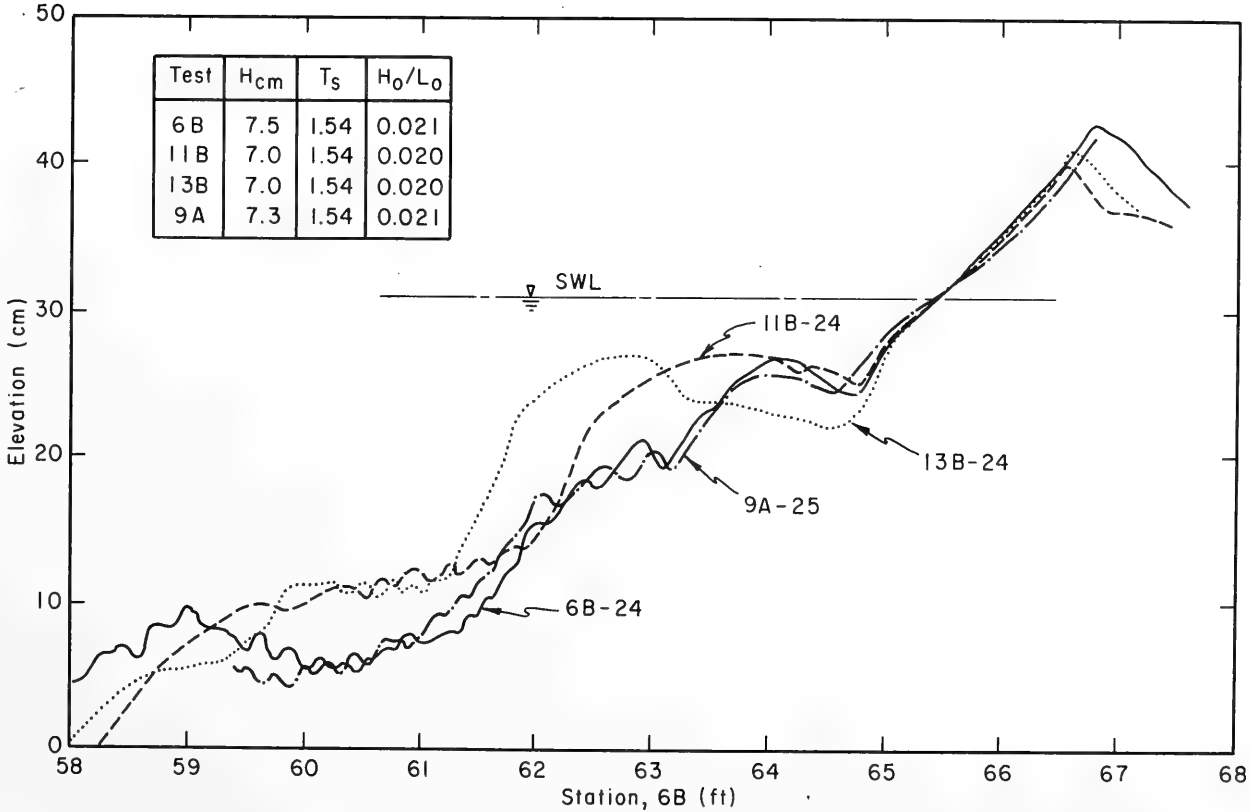

Figure 21. Comparison of four independent profiles for ground glass (D_{50} = 0.6 mm).

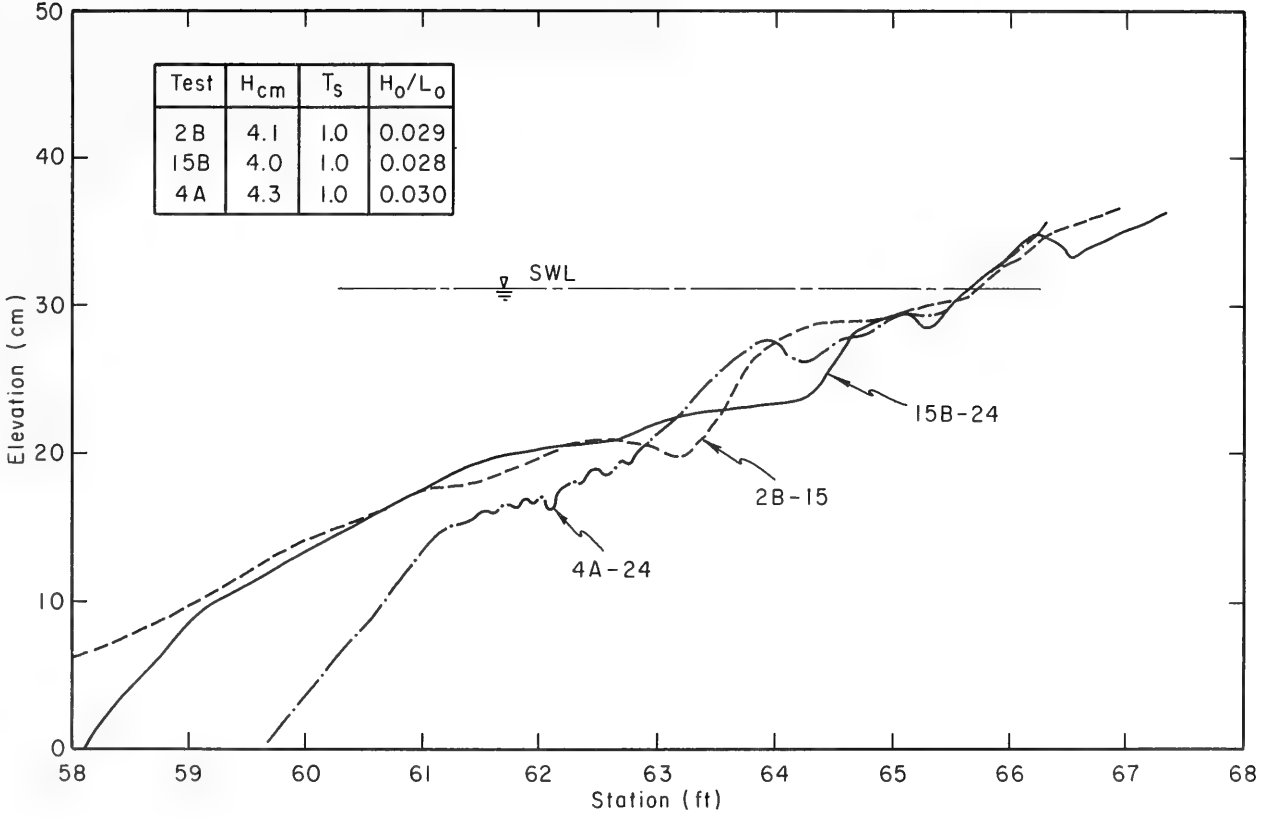

Figure 22. Comparison of three independent profiles for ground glass (D_{50} = 0.6 mm).

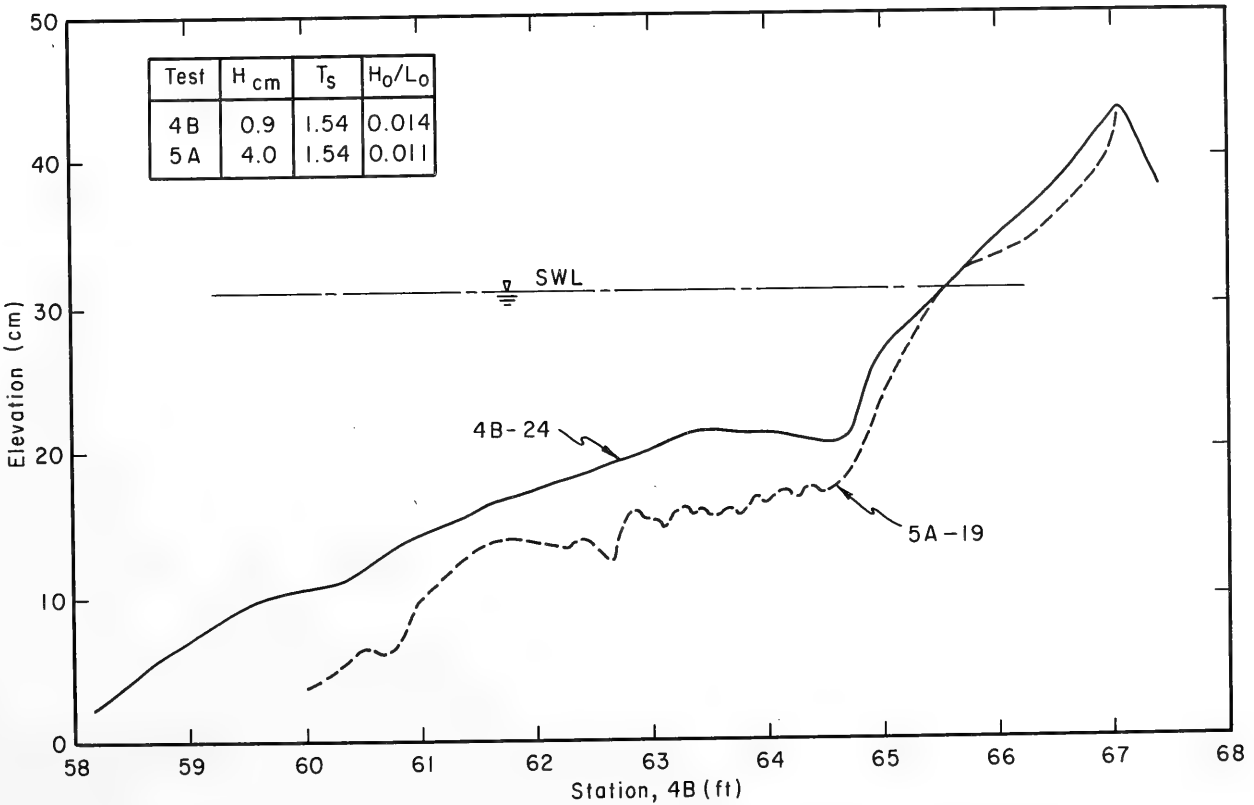

Figure 23. Comparison of two independent profiles for ground glass (D_{50} = 0.6 mm).

4. Experimental Evaluation of Proposed Model Law of Noda.

The last part of this study was modeling beach profiles obtained independently by CERC and not available to Tetra Tech, Incorporated, at the time of testing. A summary of test conditions for the CERC unpublished profiles is given in Table 6.

An investigation of the implications of Noda's model law (eqs. 17 and 18) indicated a requirement for a modeling material having a submerged specific weight in the range $\gamma' = 0.3$ to 0.8 with a size in the range of $D_{50} = 0.6$ to 1.5 millimeters for the most useful modeling scale in the available wave flume.

In practice, this particular submerged specific weight range was awkward. The materials available were "loaded" PVC ($\gamma' = 0.3$ to 0.4), rocklite (a patented ceramic sand, $\gamma' = 0.3$), pumice ($\gamma' = 0.6$ to 1.2), coal ($\gamma' = 0.3$), anthracite ($\gamma' = 0.3$ to 0.5) and various miscellaneous substances like ground walnut shells and ground apricot shells. Materials chosen for this study were pumice, PVC, and rocklite. Unfortunately, each of these materials presents some problems.

PVC is used commercially in "granular" form, normally a size of 2 to 4 millimeters. Several hundred pounds were special-ordered in "pulverized" form with a median diameter of 0.6 millimeter after washing out the dust. However, at such sizes the surface-tension problem was insurmountable. After several weeks of soaking and treatment with detergent the material formed a beach, but even the slightest wave action would "float" the material in large masses.

Pumice appeared to offer many advantages after the dust was well washed out and its behavior in water created no problem other than a slight milky cloudiness. However, pumice abraded under handling and its density was difficult to determine. The dry specific weight of pumice is about 1.6; different qualities are available with higher specific weights of 1.8 to slightly over 2. The grains definitely soak up water and probably behave as if they have a higher effective specific weight, but this effect is unknown.

Rocklite appeared to have several practical advantages. It is relatively cheap, and does not dirty the water too badly. Grain sizes larger than 2 to 3 millimeters may include air pockets, but this was not a problem during tests which used a "rocklite sand" having a median diameter of 1.2 millimeters.

Rocklite and pumice were used for the model evaluation tests. In practice, the rocklite was the most suitable material for modeling the 0.22-millimeter sand; pumice was the most suitable for modeling the 0.46-millimeter sand.

A summary of the model scale-ratio computations for rocklite, PVC, and pumice versus sand of 0.22- and 0.46-millimeter diameter, and a set of scale ratios for ground glass of 0.3 millimeter versus 0.6 millimeter

Table 6. Summary CERC test conditions (Saville, 1957).

Reference code	Wave period (s)	Wave height (ft)	Water depth (ft)	Initial beach slope	Sand size	
					D_{50} = 0.22mm	D_{50} = 0.46mm
1	11.33	4.2	15.0	1 on 15	P[1]	U[2]
2	11.33	2.4	15.0	1 on 15	P	U
3	11.33	5.5	14.0	1 on 15	P	U
4	5.60	5.3	14.5	1 on 15	P	U
5	3.75	4.8	15.0	1 on 15	U	U
5A	16.00	2.0	15.0	-------	U	N[3]
6	16.00	1.8	15.0	1 on 15	U	N
6A	16.00	6.0	15.0	-------	U	N
7	16.0	5.3	12.5	1 on 15	U	U

[1]Published.
[2]Unpublished.
[3]Not performed.

(scales were confirmed by tests made for this condition) are presented in Table 7. Runs 13A and 14A are models of runs 9A and 10A.

Conditions for the model evaluation tests are given in Table 8; results are shown in Figures 24 to 27.

These tests failed to verify the model law. The slope (but not position) of the foreshore zone was reproduced fairly well in three of the four tests. The offshore and surf zone profiles were not reproduced. Moreover, the model predicted that the shorelines would prograde significantly; however, the prototype shoreline retreated or prograded only slightly.

The model law was based upon modeling the slope of the foreshore, and the good agreement between the model and prototype in this region is encouraging for two reasons: (a) Noda's model law is useful in simulating the shape of the foreshore; and (b) the "empirical approach" may be useful in establishing scale relationships for distances between particular beach features at other limited ranges of depth.

The particle Froude and Reynolds numbers under waves vary with depth and time, and, as a result, the mechanics of sediment suspension and transport cannot be reproduced at all depths simultaneously. At most, a model law can only be correct over a limited depth range; for this model law it is the foreshore zone.

The lack of repeatability in the position of the bar suggests that the equilibrium profile should not be used as a basis for modeling.

V. COMPARISON WITH OTHER PROFILES

Several investigators (discussed previously) have proposed relationships for the value of certain physical characteristics of beach profiles, and Sitarz (1963) and Nicholson (1968) are the most prominent. The experimental data gathered in this study can be compared with some of their relationships.

Sitarz (1963) proposed two principal relationships:

$$X_o = A_1 (\gamma')^{-0.5} D_1^{-0.5} H^{1.5} \quad (19)$$

and

$$m = 2A_1^{-1} (\gamma')^{0.5} D_1^{0.5} H^{-0.5} , \quad (20)$$

where,

X_o = distance offshore measured from the beach crest to the origin of a parabola defining the offshore profile. This distance is close to the breaker to beach crest distance (in meters);

Table 7. Summary of scale ratios for various materials.

Material	Prototype material	$n_{\gamma'}$	n_D	μ	λ
Rocklite D_{50} = 1.2mm	Sand, D_{50} = 0.22	0.182	5.45	0.0708	0.059
	Sand, D_{50} = 0.46	0.182	2.61	0.0186	0.010
Pumice D_{50} = 0.8mm	Sand, D_{50} = 0.22	0.363	3.64	0.347	0.366
	Sand, D_{50} = 0.46	0.363	1.74	0.0905	0.062
PVC D_{50} = 0.6mm	Sand, D_{50} = 0.22	0.182	2.73	0.0201	0.011
	Sand, D_{50} = 0.46	0.182	1.30	0.0052	0.0019
Glass D_{50} = 0.3mm	Glass D_{50} = 0.6mm	1.0	0.5	0.284	0.189

Table 8. Test conditions for attempted model law verification.

Model/CERC	H, (cm)	T, (s)	d, (cm)	μ	λ	H_o/L_o
Rocklite/7(0.22)	11.4	4.26	26.9	0.0708	0.059	0.0028
Rocklite/3(0.22)	11.9	3.01	30.2	0.0708	0.059	0.0078
Rocklite/6(0.22)	3.9	4.26	32.4	0.0708	0.059	0.00099
Pumice/4(0.46)	14.6	1.68	40.0	0.0905	0.062	0.035

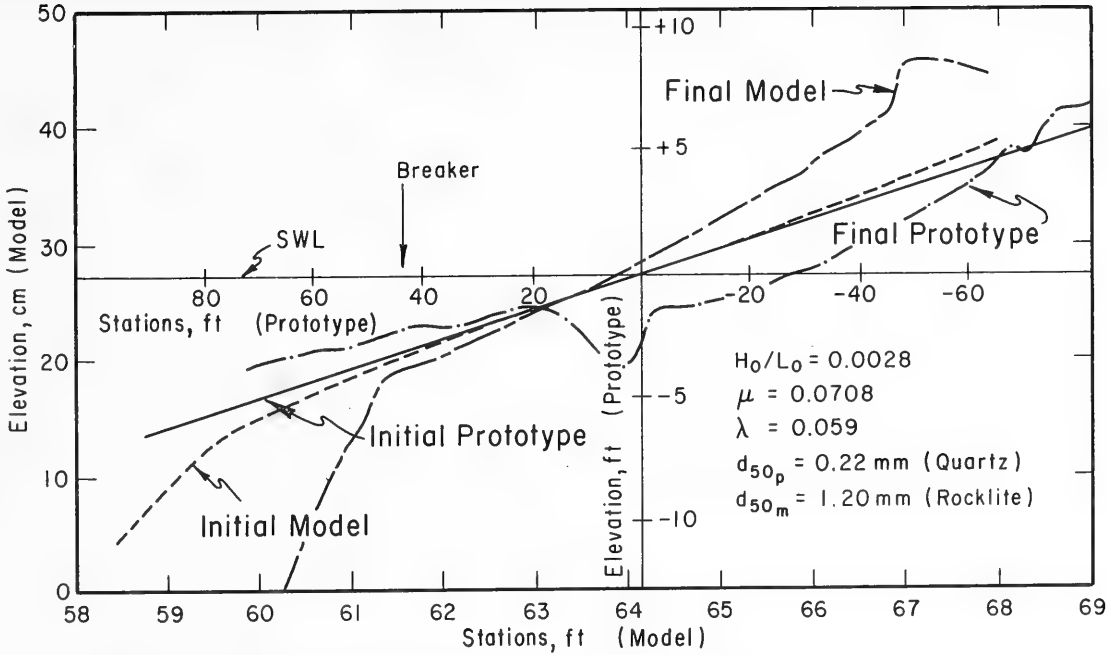

Figure 24. Attempted verification test for CERC run number 7 (0.22-millimeter sand) using rocklite.

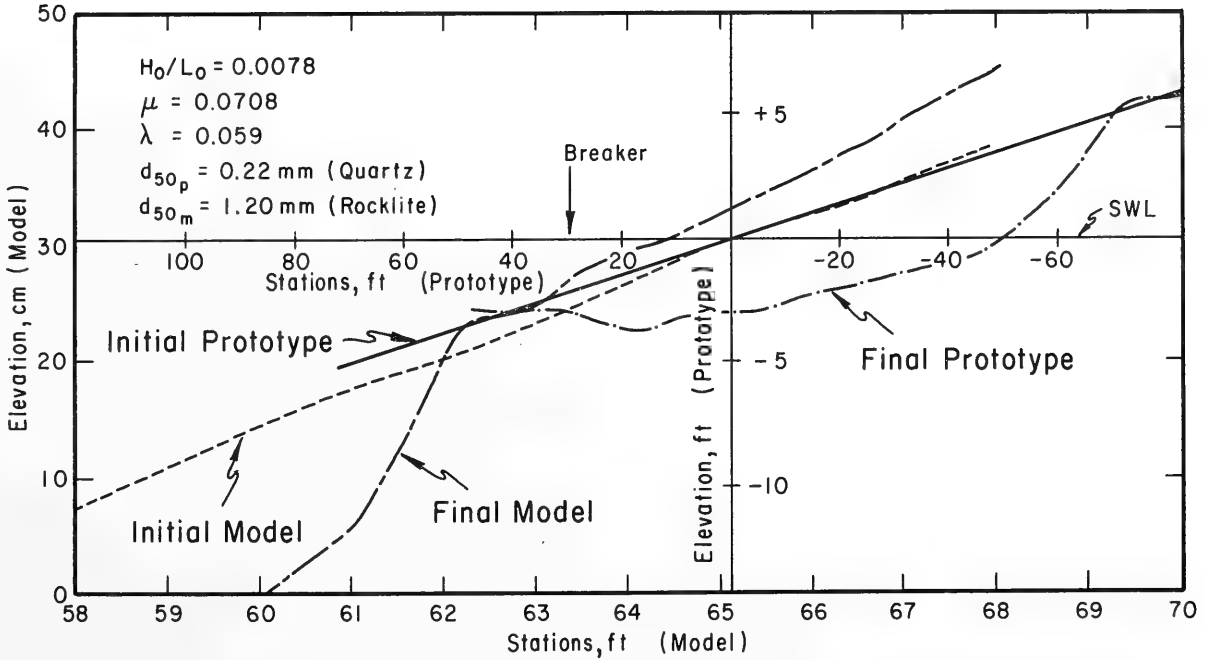

Figure 25. Attempted verification test for CERC run number 3 (0.22-millimeter sand) using rocklite.

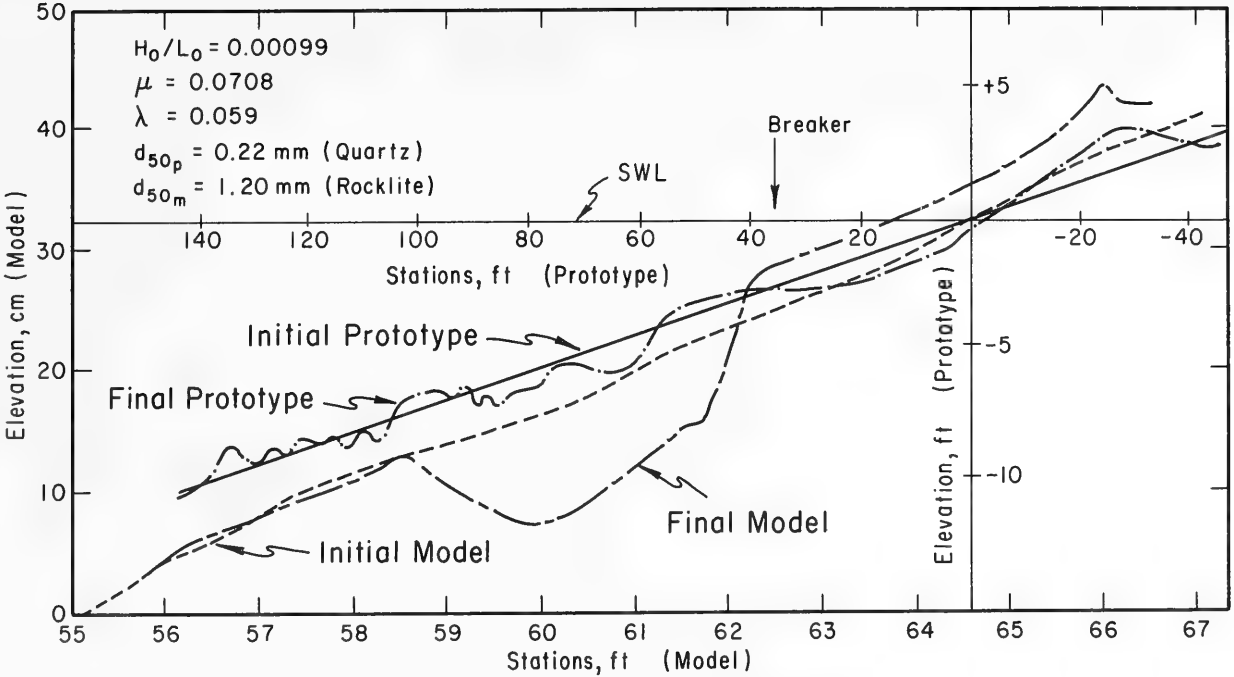

Figure 26. Attempted verification test for CERC run number 6 (0.22-millimeter sand) using rocklite.

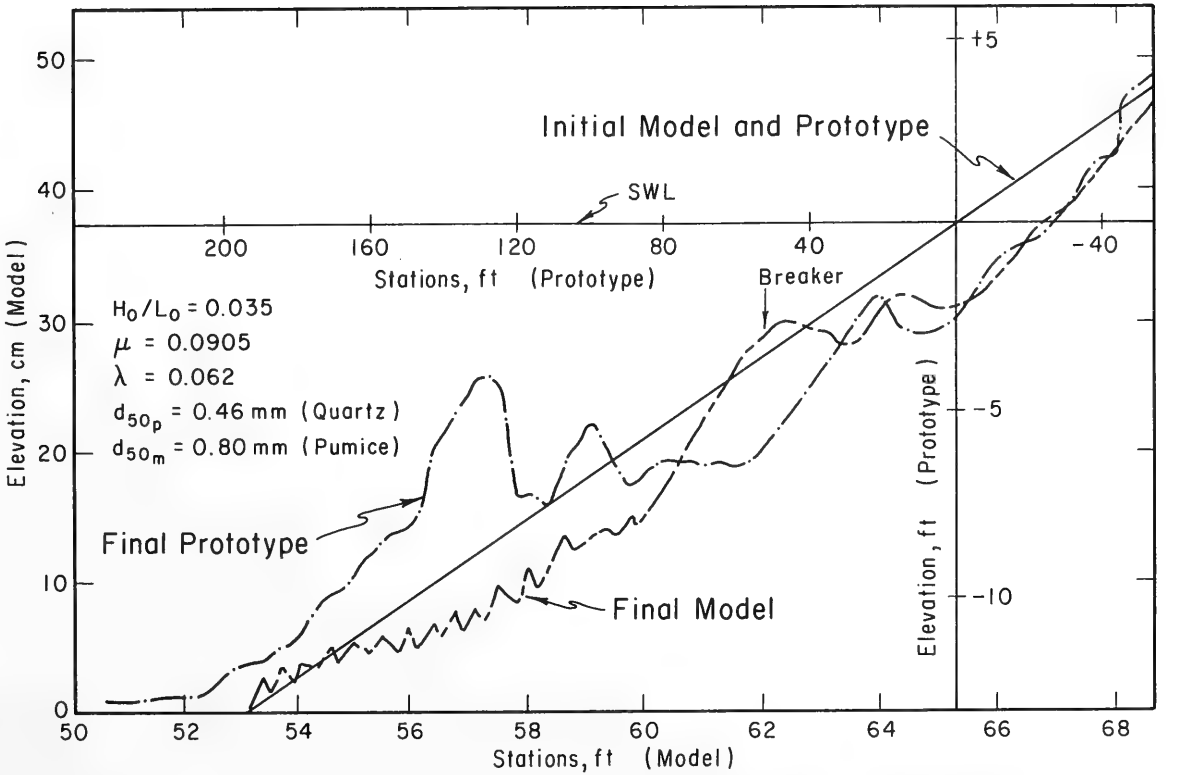

Figure 27. Attempted verification test for CERC run number 4 (0.46-millimeter sand) using pumice.

D_1 = median diameter of the beach sediment in the breaking zone (in millimeters);

H = wave height in the wave flume (in meters);

γ' = submerged unit weight;

A_1 = a constant (=43.5) for a wave flume but varies for wave basins and shorelines; and

m = slope of the beach face.

Figures 28 and 29 compare the results obtained in this study with the relationships of Sitarz (1963). In judging this data, the following should be considered:

(a) The observed X_o was taken as the distance from the stillwater line to the breaker; and

(b) the beach face slope was taken as the ratio of the elevation change from the breaker point to the stillwater line to X_o.

The results from these experiments do not agree well with the relationship of Sitarz.

Although the observed values used for X_o and m do not satisfy the definitions of Sitarz exactly, some relationship might be expected, e.g., the relationships of Sitarz (1963) imply $\lambda \sim \mu^{1.5}$ for the same material in model and prototype.

Nicholson (1968) derived a relationship between Y_s/H_o and H_o/L_o for sand beaches, where Y_s was defined as the vertical distance between the crest of the bar and the crest of the beach for a "barred" profile, and was defined as the vertical distance between the top of the step and the crest of the beach for a "stepped" profile (see Fig. 4). Figure 30 presents the results obtained in these tests and shows no agreement between the data collected and the relationship of Nicholson.

In the case of very shallow water;

$$U_{b\ max} \sim 0.5\ H\ g^{1/2}\ d^{-1/2}\ , \qquad (21)$$

where,

$U_{b\ max}$ = maximum orbital velocity at the bed;

H = local wave height;

g = gravity constant; and

d = local water depth.

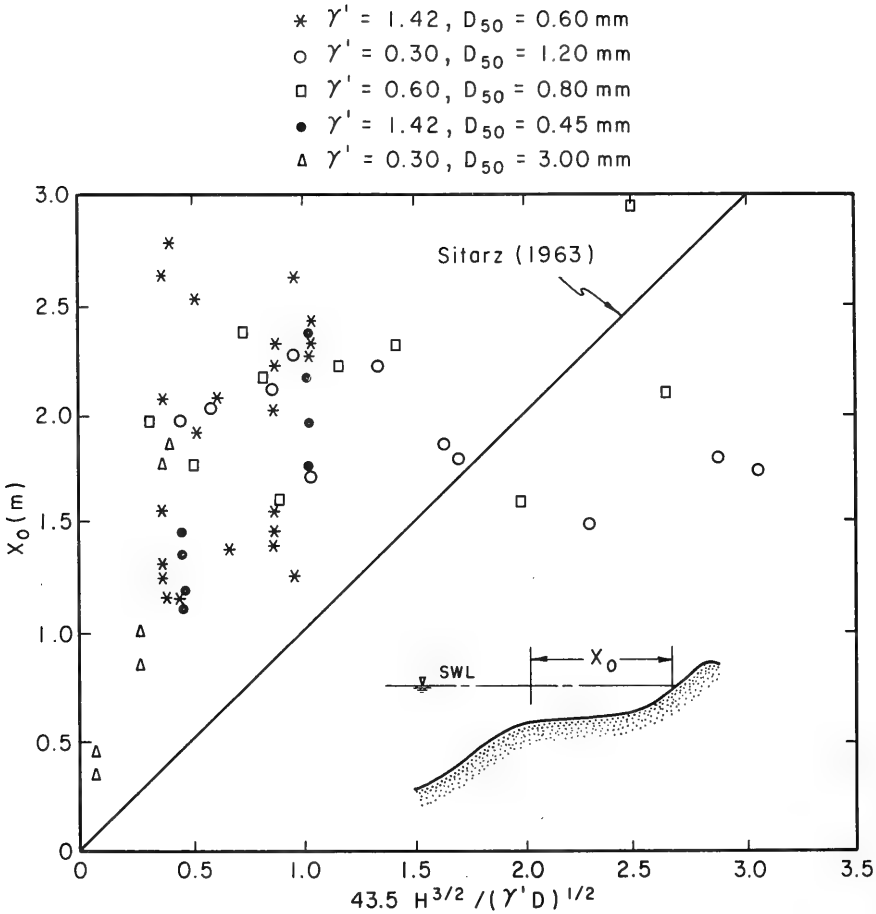

Figure 28. Comparison of shoreline to breaker distance with relationship of Sitarz (1963).

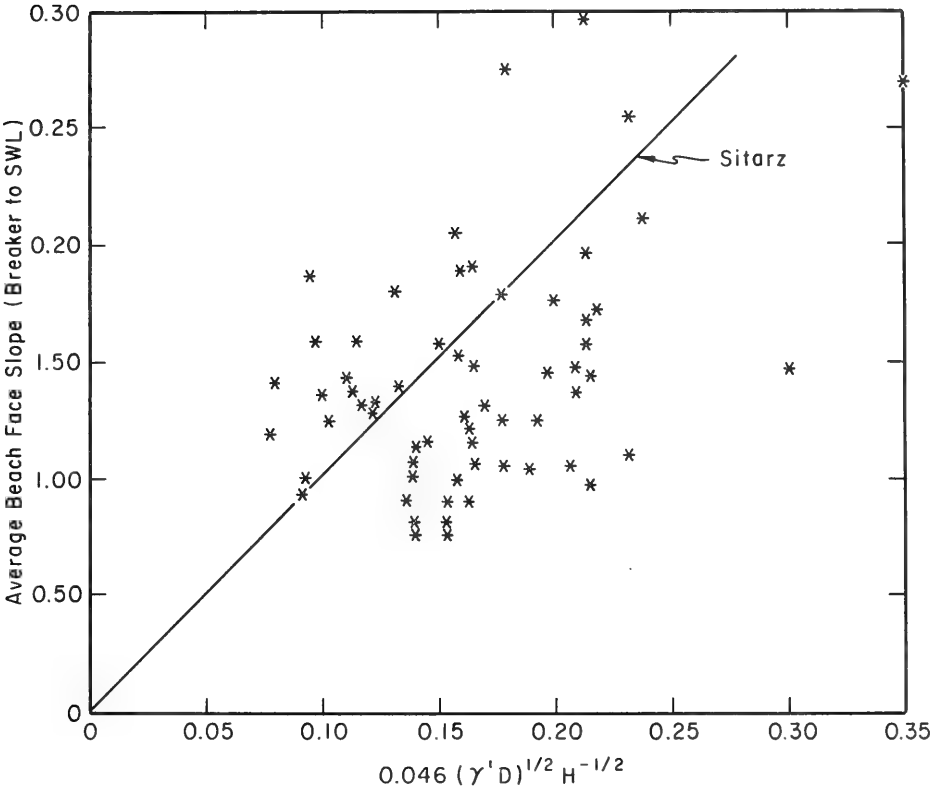

Figure 29. Observed beach face slope compared with relationship of Sitarz (1963).

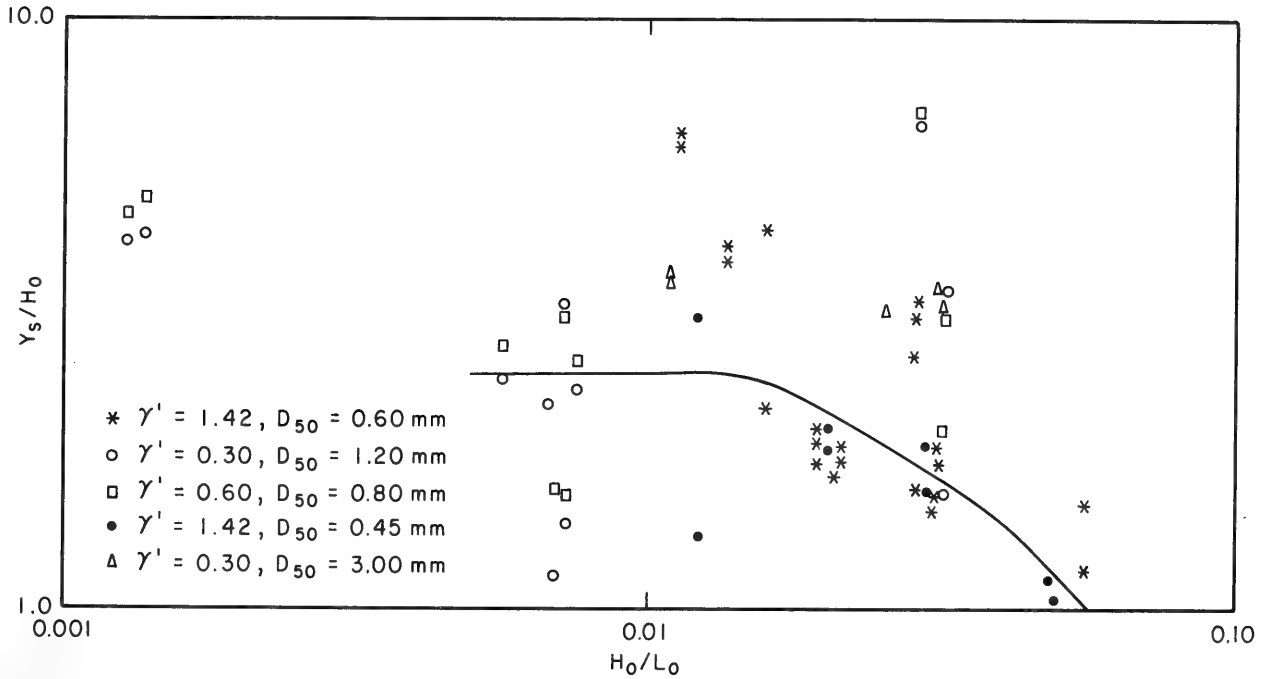

Figure 30. Comparison of experimental data with relationship by Nicholson (1968) for beach crest height.

The densimetric Froude number at which a grain will just move was defined as:

$$F_{*_c} = U_{*_c} \, g^{-1/2} \, \gamma'^{-1/2} D_{50}^{-1/2} \quad , \tag{22}$$

where,

U_{*_c} = critical shear velocity; and

D_{50} = median grain-size diameter.

Assuming U_{*_c} as proportional to $U_{b\ max}$ at the point of inception of beach material movement offshore of the breaker, and substituting equation (21) into equation (22) yield:

$$F_{*_c} \sim H \, (\gamma' \, D d_c)^{-1/2} \quad . \tag{23}$$

The profiles were examined to determine d_c, defined as the limiting depth at which the profile changed initially, and the function $H(\gamma' D d_c)^{-0.5}$ was computed for each profile where d_c was determined to be less than the water depth in the flume. If equation (23) is valid, it was expected that this function would be a constant. Figure 31 shows the results obtained when d_c is plotted versus $H(\gamma' D)^2$, indicating that the function is not a constant. Most data are for the ground glass or glass beads since the lighter weight materials generally moved to the bottom.

None of the several theoretical and empirical relationships developed to predict profile shape as a function of wave conditions and sediment characteristics have been found to be universally applicable for modeling purposes.

VI. CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions.

(a) Effect of Model Particle Shape and Size Distribution.

(1) Strongly bimodal grain-size distributions under small wave steepnesses produce profiles with multiple bars. These multiple bars do not appear when the sediment has the same median diameter but a unimodal distribution.

(2) Very narrow grain-size distributions and smooth spherical shapes produce profiles having unstable bars which intermittently grow and disappear.

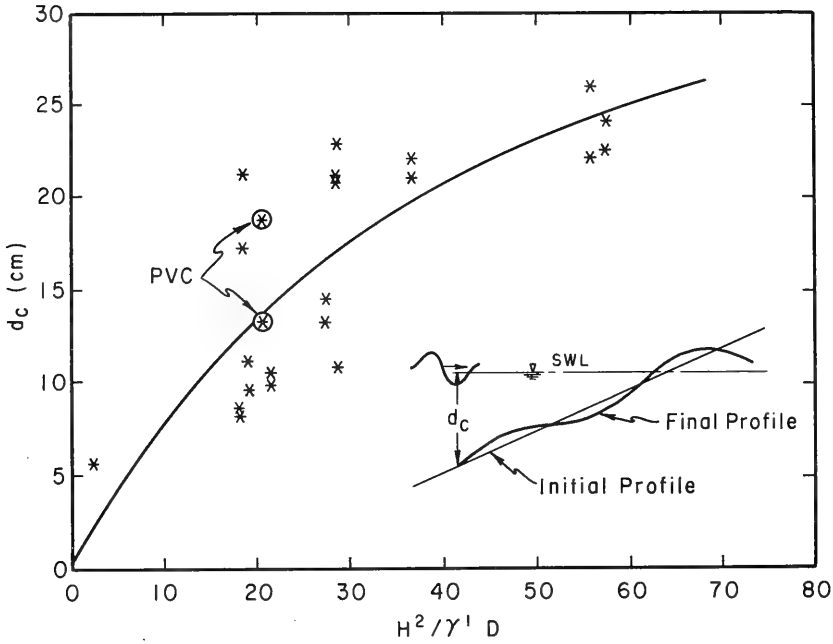

Figure 31. Comparison of beach profile changes with critical depth of motion.

(b) Model Materials Evaluation.

(1) Pulverized PVC sieved to provide a desired size distribution proved to be totally unsuccessful as a model material because of surface-tension effects.

(2) Pumice, although better than PVC, was not a satisfactory model material; pumice abrades and its density varies when submerged.

(3) Rocklite appears to be a potentially useful model material; however, more comprehensive tests are required to determine its usefulness.

(c) Equilibrium Profiles.

(1) The initial beach slope influences the final stable profile shape.

(2) The position of the longshore bar on stable profiles produced by identical wave conditions was not repeatable.

(3) The validity of the concept of profile equilibrium (as usually understood) and of model laws based upon assumed equilibrium, are doubtful.

(d) Noda's (1972) Model Law.

(1) The model law failed the verification tests. The shape of the offshore and inshore zones was not reproduced and the movement of the shoreline was not correctly predicted.

(2) The slope of the foreshore zone (from the SWL intercept to the toe of the foreshore) was correctly predicted in three of the four verification tests.

(3) Noda's empirical approach may be useful in establishing scale relationships for other well-defined reference lengths of the nearshore profile.

2. Recommendations.

(a) The use of model materials which have strongly bimodal or very narrow unimodal size distributions should be avoided.

(b) The use of model materials which have smooth spherical grain shapes should be avoided.

(c) The concept of the equilibrium profile needs further investigation.

(d) Rocklite needs further evaluation as a potential model material.

(e) Noda's (1972) model law apparently predicts only the slope of the foreshore; its general use is not recommended.

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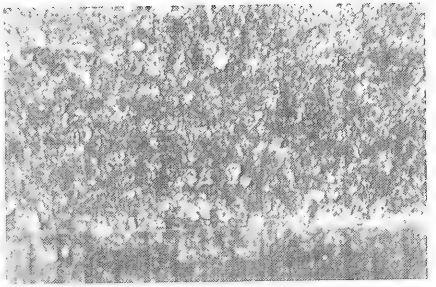
APPENDIX A

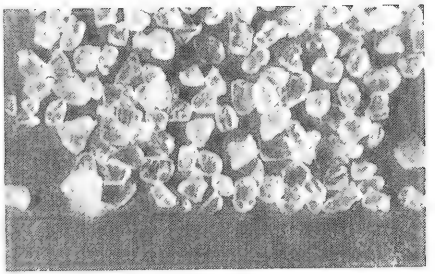
MATERIALS USED IN TESTS

The materials referenced in Table 2 are shown in Figures A-1, A-2, and A-3. Sieve analyses are summarized in Figures A-4 and A-5.



Ground glass, $\gamma' = 1.42$
$D_{50} = 0.3$ mm

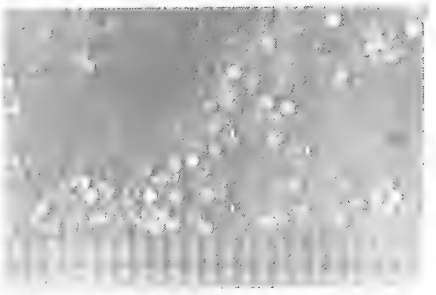
Ground glass, $\gamma' = 1.42$
$D_{50} = 0.6$ mm



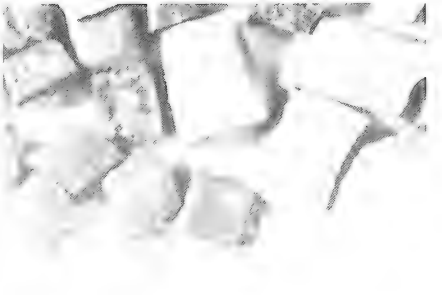
Ground glass, $\gamma' = 1.42$
$D_{50} = 1.2$ mm

Ground beads, $\gamma' = 1.42$
$D_{50} = 0.3$ mm

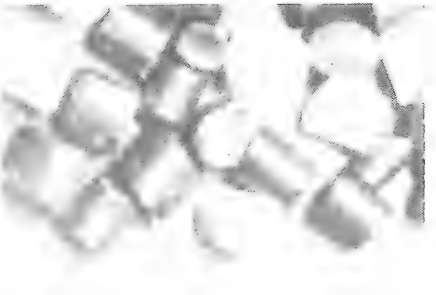
Figure A-1. Photos of materials tested.



Glass beads, $\gamma' = 1.62$
$D_{50} = 0.6$ mm



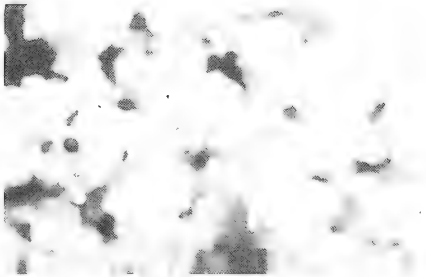
PVC cubes, $\gamma' = 0.3$
$D_{50} = 3$ mm



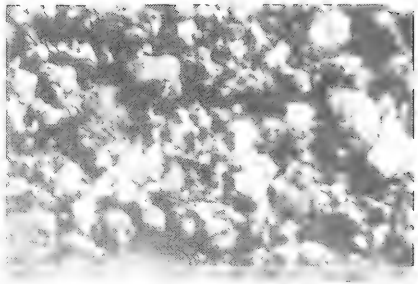
PVC cylinders, $\gamma' = 0.3$
$D_{50} = 3$ mm

PVC ground, $\gamma' = 0.3$
$D_{50} = 3$ mm

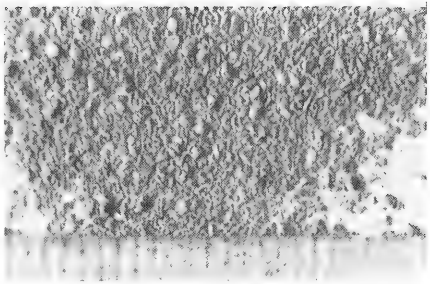
Figure A-2. Photos of materials tested.



Dry pumice, $\gamma' = 0.6$
$D_{50} = 0.8$



Rocklite, $\gamma' = 0.3$
$D_{50} = 0.3$



PVC (pulverized), $\gamma' = 0.3$
$D_{50} = 0.6$ mm

Figure A-3. Photos of materials tested.

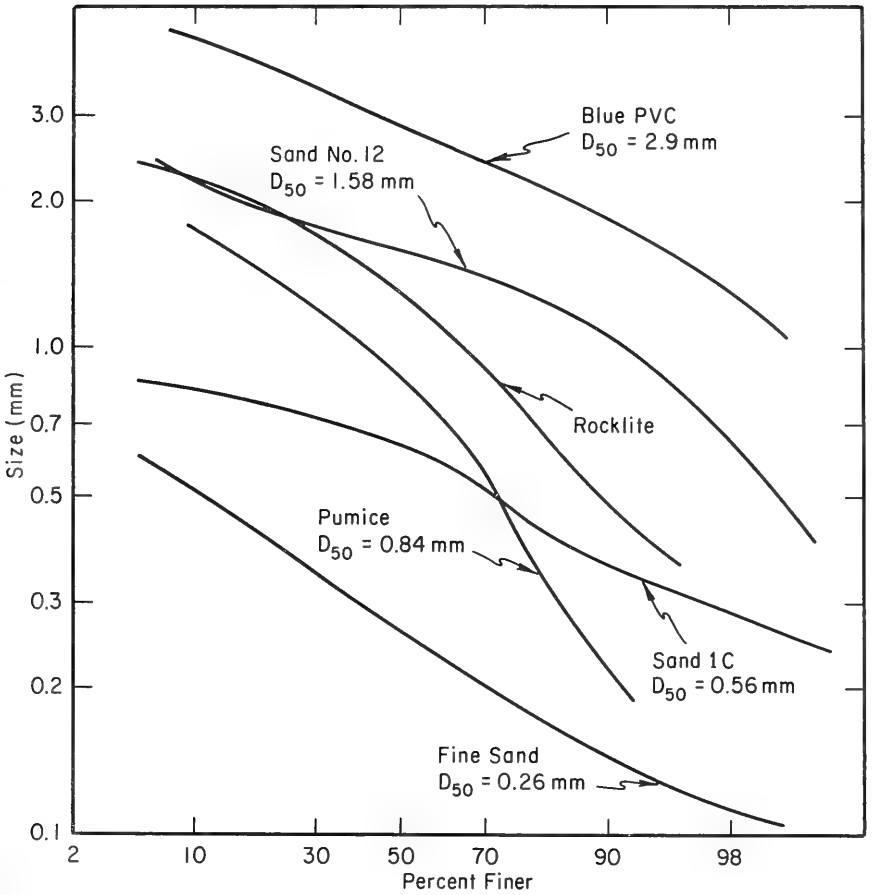


Figure A-4. Test material sieve analysis data.

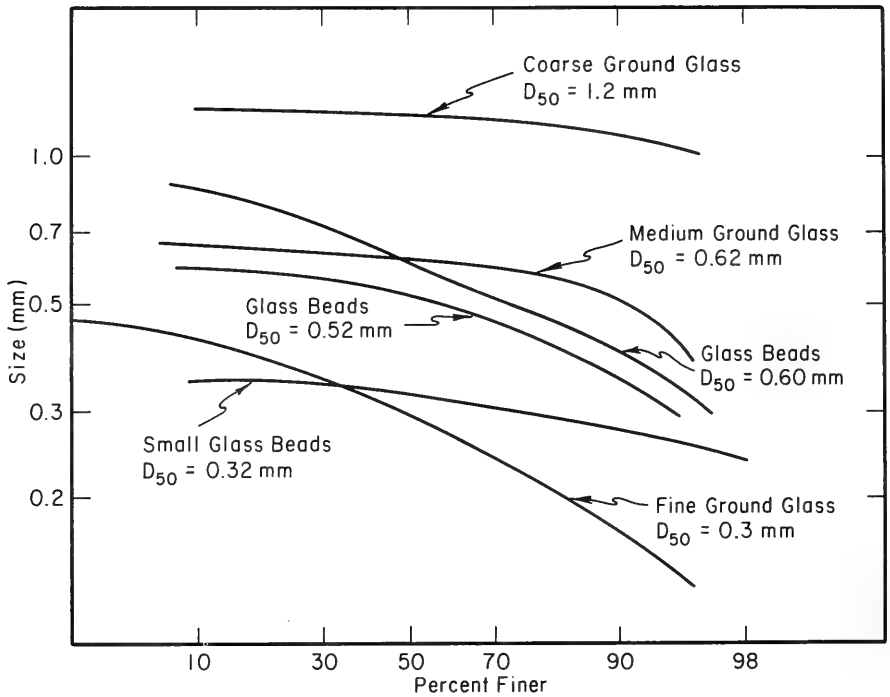


Figure A-5. Test material sieve analysis data.

APPENDIX B

TABULATED ORIGINAL DATA

Tables in Appendix B are identified by a number (sometimes followed by a letter) followed by a hyphen with either the letter I (for initial) or another number. The last number indicates the number of hours of running time. The tables are given in sequence X, Y, where X is the station in the wave flume in feet and Y is the vertical coordinate measured in centimeters.

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
1=NODA					
6.067E+01	8.500E-01	6.075E+01	8.000E-01	6.100E+01	5.740E+00
6.108E+01	6.600E+00	6.117E+01	8.430E+00	6.125E+01	9.480E+00
6.133E+01	1.078E+01	6.142E+01	1.207E+01	6.150E+01	1.310E+01
6.158E+01	1.405E+01	6.167E+01	1.596E+01	6.175E+01	1.698E+01
6.183E+01	1.755E+01	6.192E+01	1.803E+01	6.200E+01	1.860E+01
6.208E+01	1.880E+01	6.225E+01	1.910E+01	6.250E+01	1.911E+01
6.258E+01	1.894E+01	6.267E+01	1.928E+01	6.275E+01	2.013E+01
6.283E+01	2.105E+01	6.300E+01	2.135E+01	6.308E+01	2.172E+01
6.317E+01	2.180E+01	6.325E+01	2.223E+01	6.334E+01	2.282E+01
6.350E+01	2.385E+01	6.367E+01	2.560E+01	6.379E+01	2.678E+01
6.385E+01	2.835E+01				
2=NODA					
6.025E+01	3.300E-01	6.050E+01	4.900E+00	6.075E+01	8.300E+00
6.100E+01	1.145E+01	6.117E+01	1.295E+01	6.125E+01	1.470E+01
6.133E+01	1.589E+01	6.142E+01	1.668E+01	6.150E+01	1.725E+01
6.158E+01	1.790E+01	6.167E+01	1.810E+01	6.175E+01	1.805E+01
6.183E+01	1.760E+01	6.192E+01	1.700E+01	6.200E+01	1.678E+01
6.208E+01	1.670E+01	6.217E+01	1.682E+01	6.225E+01	1.750E+01
6.233E+01	1.820E+01	6.242E+01	1.825E+01	6.250E+01	1.850E+01
6.258E+01	1.820E+01	6.227E+01	1.815E+01	6.275E+01	1.840E+01
6.283E+01	1.845E+01	6.300E+01	1.955E+01	6.317E+01	2.005E+01
6.333E+01	2.035E+01	6.350E+01	2.070E+01	6.367E+01	2.165E+01
6.383E+01	2.332E+01	6.400E+01	2.470E+01		
3=NODA					
6.110E+01	5.000E-01	6.130E+01	1.000E+00	6.150E+01	1.500E+00
6.170E+01	3.800E+00	6.190E+01	4.600E+00	6.200E+01	5.100E+00
6.220E+01	6.000E+00	6.230E+01	6.100E+00	6.250E+01	7.000E+00
6.280E+01	8.600E+00	6.290E+01	9.500E+00	6.320E+01	1.040E+01
6.330E+01	1.060E+01	6.350E+01	1.110E+01	6.370E+01	1.170E+01
6.380E+01	1.190E+01	6.580E+01	1.530E+01	6.600E+01	1.550E+01
6.620E+01	1.620E+01	6.630E+01	1.670E+01	6.650E+01	1.910E+01
6.670E+01	1.970E+01	6.690E+01	2.030E+01	6.700E+01	2.120E+01
6.720E+01	2.220E+01	6.730E+01	2.370E+01	6.750E+01	2.510E+01
6.770E+01	2.700E+01	6.790E+01	3.050E+01	6.800E+01	3.350E+01
6.820E+01	3.680E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
4-NODA					
6.100E+01	1.600E+00	6.130E+01	3.100E+00	6.150E+01	3.800E+00
6.180E+01	5.200E+00	6.200E+01	6.400E+00	6.230E+01	7.500E+00
6.250E+01	8.600E+00	6.280E+01	9.700E+00	6.300E+01	1.080E+01
6.330E+01	1.140E+01	6.350E+01	1.180E+01	6.380E+01	1.280E+01
6.400E+01	1.360E+01	6.430E+01	1.440E+01	6.450E+01	1.430E+01
6.480E+01	1.510E+01	6.500E+01	1.530E+01	6.530E+01	1.840E+01
6.550E+01	1.960E+01	6.580E+01	2.040E+01	6.600E+01	1.840E+01
6.630E+01	1.920E+01	6.650E+01	2.040E+01	6.680E+01	2.120E+01
6.700E+01	2.180E+01	6.730E+01	2.300E+01	6.750E+01	2.580E+01
6.780E+01	2.520E+01	6.800E+01	2.640E+01	6.820E+01	2.850E+01
5-NODA					
6.130E+01	2.100E+00	6.150E+01	2.400E+00	6.180E+01	3.900E+00
6.200E+01	4.700E+00	6.250E+01	7.300E+00	6.280E+01	8.300E+00
6.300E+01	9.600E+00	6.330E+01	1.000E+01	6.350E+01	1.050E+01
6.380E+01	1.100E+01	6.400E+01	1.190E+01	6.430E+01	1.280E+01
6.450E+01	1.390E+01	6.480E+01	1.460E+01	6.500E+01	1.440E+01
6.530E+01	1.530E+01	6.550E+01	1.550E+01	6.580E+01	1.520E+01
6.600E+01	1.690E+01	6.620E+01	1.910E+01	6.630E+01	1.970E+01
6.650E+01	2.060E+01	6.670E+01	2.110E+01	6.690E+01	2.210E+01
6.700E+01	2.360E+01	6.730E+01	2.680E+01	6.750E+01	2.460E+01
6.770E+01	2.460E+01	6.790E+01	2.570E+01	6.800E+01	2.820E+01
6.820E+01	3.210E+01				
6-NODA					
6.100E+01	1.110E+00	6.130E+01	3.400E+00	6.150E+01	3.250E+00
6.180E+01	5.070E+00	6.200E+01	5.650E+00	6.230E+01	6.500E+00
6.250E+01	7.900E+00	6.280E+01	9.080E+00	6.300E+01	9.560E+00
6.330E+01	9.800E+00	6.350E+01	1.005E+01	6.380E+01	1.072E+01
6.400E+01	1.118E+01	6.430E+01	1.252E+01	6.450E+01	1.282E+01
6.480E+01	1.310E+01	6.500E+01	1.350E+01	6.530E+01	1.440E+01
6.550E+01	1.400E+01	6.570E+01	1.430E+01	6.510E+01	1.760E+01
6.600E+01	1.940E+01	6.630E+01	2.030E+01	6.650E+01	2.180E+01
6.680E+01	2.270E+01	6.700E+01	2.440E+01	6.730E+01	2.610E+01
6.750E+01	2.840E+01	6.780E+01	2.820E+01	6.800E+01	2.860E+01
6.820E+01	2.870E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
7-NODA					
6.130E+01	1.700E+00	6.150E+01	2.300E+00	6.180E+01	3.700E+00
6.200E+01	4.800E+00	6.230E+01	6.000E+00	6.250E+01	7.200E+00
6.280E+01	8.200E+00	6.300E+01	8.700E+00	6.330E+01	9.000E+00
6.350E+01	1.030E+01	6.380E+01	1.070E+01	6.400E+01	1.160E+01
6.430E+01	1.210E+01	6.450E+01	1.310E+01	6.480E+01	1.390E+01
6.500E+01	1.550E+01	6.530E+01	1.550E+01	6.550E+01	1.450E+01
6.570E+01	1.430E+01	6.590E+01	1.450E+01	6.600E+01	1.480E+01
6.630E+01	1.910E+01	6.650E+01	2.070E+01	6.680E+01	2.220E+01
6.700E+01	2.440E+01	6.730E+01	2.770E+01	6.750E+01	3.020E+01
6.780E+01	2.670E+01	6.800E+01	2.830E+01	6.820E+01	2.960E+01
8-NODA					
6.067E+01	9.600E-01	6.098E+01	1.420E+00	6.100E+01	3.940E+00
6.117E+01	3.460E+00	6.129E+01	5.280E+00	6.142E+01	4.020E+00
6.159E+01	5.680E+00	6.174E+01	5.950E+00	6.182E+01	6.580E+00
6.196E+01	5.730E+00	6.217E+01	8.400E+00	6.233E+01	7.710E+00
6.251E+01	9.730E+00	6.271E+01	9.850E+00	6.295E+01	1.057E+01
6.319E+01	1.187E+01	6.334E+01	1.146E+01	6.431E+01	1.384E+01
6.464E+01	1.423E+01	6.500E+01	1.569E+01	6.521E+01	1.912E+01
6.526E+01	1.959E+01	6.556E+01	2.048E+01	6.571E+01	1.995E+01
6.589E+01	2.027E+01	6.608E+01	2.000E+01	6.618E+01	2.040E+01
6.663E+01	2.141E+01	6.688E+01	2.188E+01	6.713E+01	2.351E+01
6.760E+01	2.661E+01	6.761E+01	2.810E+01	6.781E+01	2.944E+01
6.838E+01	3.665E+01	6.871E+01	3.492E+01	6.909E+01	4.047E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
9=NODA					
6.093E+01	3.060E+00	6.112E+01	4.380E+00	6.120E+01	3.890E+00
6.129E+01	5.240E+00	6.132E+01	5.400E+00	6.143E+01	5.360E+00
6.154E+01	6.830E+00	6.166E+01	7.530E+00	6.170E+01	8.100E+00
6.172E+01	8.090E+00	6.173E+01	8.080E+00	6.178E+01	7.910E+00
6.182E+01	8.230E+00	6.185E+01	8.020E+00	6.190E+01	8.350E+00
6.196E+01	8.180E+00	6.201E+01	8.900E+00	6.202E+01	8.960E+00
6.210E+01	8.730E+00	6.214E+01	9.030E+00	6.219E+01	8.450E+00
6.225E+01	8.710E+00	6.231E+01	7.840E+00	6.235E+01	7.840E+00
6.239E+01	7.400E+00	6.242E+01	7.520E+00	6.243E+01	7.510E+00
6.246E+01	7.730E+00	6.249E+01	7.540E+00	6.250E+01	7.120E+00
6.252E+01	7.490E+00	6.257E+01	7.950E+00	6.261E+01	7.940E+00
6.263E+01	8.130E+00	6.266E+01	8.110E+00	6.270E+01	8.750E+00
6.274E+01	8.730E+00	6.289E+01	1.000E+01	6.295E+01	1.071E+01
6.298E+01	1.069E+01	6.299E+01	1.064E+01	6.301E+01	1.075E+01
6.308E+01	1.035E+01	6.313E+01	1.055E+01	6.316E+01	1.125E+01
6.317E+01	1.135E+01	6.325E+01	1.140E+01	6.328E+01	1.197E+01
6.332E+01	1.159E+01	6.334E+01	1.178E+01	6.338E+01	1.189E+01
6.342E+01	1.266E+01	6.346E+01	1.250E+01	6.352E+01	1.350E+01
6.359E+01	1.233E+01	6.367E+01	1.313E+01	6.374E+01	1.213E+01
6.381E+01	1.284E+01	6.389E+01	1.182E+01	6.396E+01	1.234E+01
6.401E+01	1.164E+01	6.405E+01	1.199E+01	6.410E+01	1.135E+01
6.416E+01	1.202E+01	6.420E+01	1.170E+01	6.424E+01	1.225E+01
6.429E+01	1.210E+01	6.432E+01	1.263E+01	6.436E+01	1.225E+01
6.443E+01	1.387E+01	6.450E+01	1.414E+01	6.451E+01	1.428E+01
6.457E+01	1.537E+01	6.463E+01	1.492E+01	6.470E+01	1.591E+01
6.474E+01	1.658E+01	6.499E+01	1.650E+01	6.508E+01	1.559E+01
6.515E+01	1.673E+01	6.522E+01	1.620E+01	6.531E+01	1.803E+01
6.538E+01	1.823E+01	6.543E+01	1.950E+01	6.561E+01	2.077E+01
6.573E+01	2.100E+01	6.581E+01	2.079E+01	6.595E+01	1.960E+01
6.606E+01	1.837E+01	6.619E+01	1.911E+01	6.630E+01	2.093E+01
6.639E+01	2.096E+01	6.648E+01	2.100E+01	6.673E+01	2.220E+01
6.691E+01	2.294E+01	6.715E+01	2.397E+01	6.759E+01	2.659E+01
6.761E+01	2.690E+01	6.765E+01	2.800E+01	6.848E+01	3.297E+01
6.895E+01	4.041E+01	6.918E+01	4.232E+01	6.925E+01	4.214E+01
6.930E+01	4.185E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
10-NODA					
6.073E+01	6.800E-01	6.082E+01	4.200E-01	6.091E+01	1.460E+00
6.119E+01	2.500E+00	6.127E+01	3.140E+00	6.136E+01	3.000E+00
6.153E+01	5.040E+00	6.160E+01	5.730E+00	6.171E+01	6.070E+00
6.181E+01	6.410E+00	6.190E+01	6.370E+00	6.200E+01	7.030E+00
6.205E+01	6.610E+00	6.213E+01	7.330E+00	6.224E+01	8.210E+00
6.228E+01	7.800E+00	6.236E+01	8.520E+00	6.243E+01	7.700E+00
6.251E+01	7.720E+00	6.257E+01	6.820E+00	6.260E+01	7.000E+00
6.264E+01	6.520E+00	6.268E+01	7.180E+00	6.295E+01	7.950E+00
6.302E+01	8.490E+00	6.315E+01	8.520E+00	6.330E+01	9.100E+00
6.335E+01	9.430E+00	6.338E+01	9.400E+00	6.342E+01	9.890E+00
6.346E+01	9.740E+00	6.351E+01	1.053E+01	6.357E+01	1.051E+01
6.363E+01	1.151E+01	6.370E+01	1.100E+01	6.384E+01	1.202E+01
6.395E+01	1.072E+01	6.400E+01	1.075E+01	6.406E+01	1.010E+01
6.411E+01	1.070E+01	6.416E+01	1.014E+01	6.420E+01	1.051E+01
6.426E+01	9.900E+00	6.430E+01	1.040E+01	6.435E+01	9.900E+00
6.440E+01	1.056E+01	6.445E+01	1.023E+01	6.455E+01	1.111E+01
6.460E+01	1.104E+01	6.465E+01	1.223E+01	6.470E+01	1.203E+01
6.475E+01	1.290E+01	6.483E+01	1.430E+01	6.500E+01	1.496E+01
6.507E+01	1.424E+01	6.518E+01	1.528E+01	6.526E+01	1.432E+01
6.543E+01	1.613E+01	6.547E+01	1.574E+01	6.564E+01	1.857E+01
6.570E+01	1.867E+01	6.580E+01	1.872E+01	6.590E+01	1.817E+01
6.600E+01	1.727E+01	6.610E+01	1.703E+01	6.633E+01	1.896E+01
6.642E+01	1.841E+01	6.650E+01	1.985E+01	6.675E+01	2.200E+01
6.693E+01	2.270E+01	6.710E+01	2.343E+01	6.730E+01	2.467E+01
6.750E+01	2.625E+01	6.770E+01	2.733E+01	6.800E+01	2.914E+01
6.820E+01	3.003E+01				
11-NODA					
6.090E+01	4.000E-01	6.106E+01	1.400E+00	6.125E+01	3.780E+00
6.150E+01	2.530E+00	6.103E+01	4.350E+00	6.187E+01	5.680E+00
6.195E+01	4.700E+00	6.215E+01	6.720E+00	6.234E+01	6.890E+00
6.250E+01	8.000E+00	6.275E+01	9.050E+00	6.290E+01	9.300E+00
6.295E+01	9.430E+00	6.313E+01	1.020E+01	6.325E+01	1.000E+01
6.348E+01	1.050E+01	6.400E+01	1.162E+01	6.420E+01	1.220E+01
6.440E+01	1.295E+01	6.475E+01	1.322E+01	6.500E+01	1.455E+01
6.515E+01	1.690E+01	6.525E+01	1.785E+01	6.560E+01	1.622E+01
6.585E+01	1.920E+01	6.620E+01	1.890E+01	6.655E+01	2.048E+01
6.669E+01	2.085E+01	6.694E+01	2.145E+01	6.700E+01	2.158E+01
6.730E+01	2.335E+01	6.770E+01	2.609E+01	6.785E+01	2.884E+01
6.817E+01	3.280E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
12-NODA					
6.090E+01	1.600E+00	6.170E+01	6.560E+00	6.209E+01	7.280E+00
6.229E+01	8.270E+00	6.295E+01	7.460E+00	6.324E+01	9.420E+00
6.373E+01	1.126E+01	6.430E+01	9.730E+00	6.541E+01	1.622E+01
6.550E+01	1.529E+01	6.562E+01	1.649E+01	6.569E+01	1.624E+01
6.584E+01	1.868E+01	6.600E+01	1.916E+01	6.633E+01	1.805E+01
6.651E+01	1.946E+01	6.661E+01	2.038E+01	6.675E+01	2.117E+01
6.692E+01	2.235E+01	6.720E+01	2.400E+01	6.780E+01	2.740E+01
6.820E+01	2.959E+01				
13-NODA					
6.069E+01	7.400E-01	6.076E+01	2.900E-01	6.082E+01	1.200E+00
6.091E+01	1.540E+00	6.110E+01	2.620E+00	6.121E+01	4.530E+00
6.127E+01	5.090E+00	6.132E+01	6.080E+00	6.140E+01	6.020E+00
6.145E+01	6.300E+00	6.149E+01	5.510E+00	6.158E+01	6.870E+00
6.176E+01	6.960E+00	6.181E+01	7.910E+00	6.187E+01	7.210E+00
6.194E+01	7.460E+00	6.200E+01	6.470E+00	6.207E+01	7.020E+00
6.212E+01	6.150E+00	6.217E+01	6.510E+00	6.223E+01	5.890E+00
6.228E+01	6.300E+00	6.233E+01	5.810E+00	6.236E+01	6.280E+00
6.240E+01	5.750E+00	6.247E+01	6.290E+00	6.255E+01	6.050E+00
6.260E+01	6.770E+00	6.265E+01	6.270E+00	6.270E+01	7.020E+00
6.274E+01	6.740E+00	6.294E+01	8.020E+00	6.302E+01	7.020E+00
6.313E+01	8.320E+00	6.320E+01	7.630E+00	6.331E+01	8.860E+00
6.342E+01	8.980E+00	6.374E+01	8.320E+00	6.390E+01	8.770E+00
6.405E+01	8.920E+00	6.420E+01	8.750E+00	6.431E+01	9.570E+00
6.437E+01	9.290E+00	6.457E+01	1.064E+01	6.463E+01	1.183E+01
6.470E+01	1.129E+01	6.474E+01	1.196E+01	6.500E+01	1.076E+01
6.510E+01	1.147E+01	6.515E+01	1.064E+01	6.520E+01	1.125E+01
6.525E+01	1.080E+01	6.530E+01	1.164E+01	6.535E+01	1.112E+01
6.540E+01	1.150E+01	6.544E+01	1.147E+01	6.548E+01	1.197E+01
6.552E+01	1.164E+01	6.558E+01	1.247E+01	6.562E+01	1.212E+01
6.573E+01	1.383E+01	6.580E+01	1.550E+01	6.586E+01	1.700E+01
6.600E+01	1.907E+01	6.620E+01	2.033E+01	6.640E+01	2.146E+01
6.660E+01	2.255E+01	6.682E+01	2.392E+01	6.700E+01	2.560E+01
6.720E+01	2.700E+01	6.727E+01	2.783E+01	6.732E+01	2.913E+01
6.739E+01	2.928E+01	6.748E+01	2.964E+01	6.751E+01	2.997E+01
6.760E+01	2.878E+01	6.772E+01	2.807E+01	6.787E+01	2.779E+01
6.802E+01	2.859E+01	6.810E+01	2.919E+01	6.820E+01	2.972E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
14=NODA					
6.082E+01	6.300E-01	6.100E+01	9.600E-01	6.105E+01	2.650E+00
6.115E+01	3.040E+00	6.122E+01	1.960E+00	6.136E+01	2.850E+00
6.143E+01	3.060E+00	6.150E+01	3.010E+00	6.162E+01	4.570E+00
6.168E+01	4.180E+00	6.175E+01	4.710E+00	6.184E+01	4.460E+00
6.195E+01	5.370E+00	6.200E+01	5.100E+00	6.212E+01	5.690E+00
6.220E+01	5.330E+00	6.232E+01	6.450E+00	6.255E+01	8.230E+00
6.274E+01	8.700E+00	6.290E+01	8.520E+00	6.320E+01	8.590E+00
6.350E+01	9.190E+00	6.380E+01	9.770E+00	6.410E+01	1.091E+01
6.440E+01	1.165E+01	6.455E+01	1.171E+01	6.475E+01	1.252E+01
6.490E+01	1.322E+01	6.512E+01	1.359E+01	6.533E+01	1.353E+01
6.550E+01	1.423E+01	6.563E+01	1.646E+01	6.572E+01	1.788E+01
6.586E+01	1.814E+01	6.595E+01	1.903E+01	6.603E+01	1.944E+01
6.625E+01	2.025E+01	6.650E+01	2.152E+01	6.675E+01	2.267E+01
6.693E+01	2.354E+01	6.722E+01	2.525E+01	6.745E+01	2.699E+01
6.750E+01	2.794E+01	6.755E+01	2.783E+01	6.765E+01	2.715E+01
6.790E+01	2.824E+01	6.805E+01	3.070E+01	6.820E+01	3.187E+01
15=NODA					
6.045E+01	9.900E-01	6.085E+01	1.920E+00	6.132E+01	1.690E+00
6.200E+01	2.090E+00	6.257E+01	1.580E+00	6.280E+01	5.620E+00
6.306E+01	8.720E+00	6.311E+01	9.620E+00	6.316E+01	9.410E+00
6.319E+01	9.740E+00	6.323E+01	9.610E+00	6.326E+01	1.073E+01
6.333E+01	1.015E+01	6.340E+01	1.105E+01	6.346E+01	1.092E+01
6.350E+01	1.180E+01	6.355E+01	1.145E+01	6.359E+01	1.219E+01
6.361E+01	1.196E+01	6.369E+01	1.308E+01	6.375E+01	1.222E+01
6.381E+01	1.322E+01	6.386E+01	1.273E+01	6.390E+01	1.362E+01
6.397E+01	1.347E+01	6.404E+01	1.471E+01	6.409E+01	1.352E+01
6.417E+01	1.482E+01	6.424E+01	1.438E+01	6.432E+01	1.529E+01
6.439E+01	1.479E+01	6.444E+01	1.569E+01	6.451E+01	1.475E+01
6.460E+01	1.605E+01	6.470E+01	1.527E+01	6.480E+01	1.646E+01
6.490E+01	1.526E+01	6.498E+01	1.660E+01	6.504E+01	1.610E+01
6.515E+01	1.752E+01	6.521E+01	1.689E+01	6.534E+01	1.944E+01
6.556E+01	1.872E+01	6.572E+01	1.721E+01	6.602E+01	1.892E+01
6.604E+01	1.839E+01	6.608E+01	1.948E+01	6.613E+01	1.889E+01
6.629E+01	2.007E+01	6.641E+01	2.099E+01	6.652E+01	2.069E+01
6.673E+01	2.065E+01	6.680E+01	2.123E+01	6.687E+01	2.041E+01
6.694E+01	2.118E+01	6.702E+01	2.170E+01	6.715E+01	2.239E+01
6.742E+01	2.417E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
16-NODA					
6.017E+01	2.000E-01	6.022E+01	7.500E-01	6.027E+01	2.200E-01
6.032E+01	5.100E-01	6.037E+01	3.100E-01	6.041E+01	1.180E+00
6.045E+01	3.600E-01	6.055E+01	7.800E-01	6.061E+01	9.800E-01
6.065E+01	1.020E+00	6.068E+01	1.320E+00	6.071E+01	8.100E-01
6.080E+01	1.370E+00	6.091E+01	1.070E+00	6.102E+01	1.520E+00
6.106E+01	1.210E+00	6.110E+01	1.680E+00	6.118E+01	1.310E+00
6.126E+01	1.990E+00	6.136E+01	1.000E+00	6.141E+01	1.500E+00
6.145E+01	7.000E-01	6.153E+01	1.380E+00	6.166E+01	7.000E-01
6.163E+01	1.280E+00	6.167E+01	1.110E+00	6.175E+01	2.700E-01
6.180E+01	1.010E+00	6.185E+01	1.940E+00	6.188E+01	1.210E+00
6.193E+01	1.620E+00	6.196E+01	1.210E+00	6.204E+01	2.210E+00
6.208E+01	1.260E+00	6.216E+01	2.000E+00	6.225E+01	1.720E+00
6.247E+01	5.120E+00	6.260E+01	7.510E+00	6.265E+01	8.300E+00
6.270E+01	8.450E+00	6.280E+01	9.240E+00	6.285E+01	1.010E+01
6.291E+01	9.910E+00	6.297E+01	1.111E+01	6.303E+01	1.032E+01
6.311E+01	1.153E+01	6.315E+01	1.119E+01	6.323E+01	1.219E+01
6.328E+01	1.155E+01	6.337E+01	1.299E+01	6.346E+01	1.228E+01
6.352E+01	1.343E+01	6.361E+01	1.271E+01	6.366E+01	1.343E+01
6.372E+01	1.301E+01	6.380E+01	1.375E+01	6.385E+01	1.322E+01
6.393E+01	1.406E+01	6.400E+01	1.338E+01	6.403E+01	1.463E+01
6.425E+01	1.437E+01	6.432E+01	1.519E+01	6.438E+01	1.443E+01
6.447E+01	1.539E+01	6.452E+01	1.488E+01	6.460E+01	1.556E+01
6.463E+01	1.487E+01	6.474E+01	1.588E+01	6.479E+01	1.510E+01
6.489E+01	1.592E+01	6.494E+01	1.549E+01	6.500E+01	1.583E+01
6.505E+01	1.556E+01	6.513E+01	1.640E+01	6.520E+01	1.612E+01
6.526E+01	1.700E+01	6.530E+01	1.691E+01	6.536E+01	1.822E+01
6.540E+01	1.822E+01	6.552E+01	1.922E+01	6.585E+01	1.610E+01
6.610E+01	1.720E+01	6.615E+01	1.687E+01	6.627E+01	1.838E+01
6.633E+01	1.813E+01	6.641E+01	1.904E+01	6.645E+01	1.816E+01
6.655E+01	2.048E+01	6.688E+01	2.022E+01	6.695E+01	2.111E+01
6.713E+01	2.094E+01	6.737E+01	2.241E+01	6.776E+01	2.455E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
17-NODA					
6.021E+01	6.900E-01	6.030E+01	1.640E+00	6.036E+01	1.410E+00
6.041E+01	1.730E+00	6.047E+01	2.470E+00	6.057E+01	1.890E+00
6.070E+01	2.410E+00	6.073E+01	2.140E+00	6.079E+01	2.680E+00
6.082E+01	1.990E+00	6.090E+01	2.870E+00	6.095E+01	2.250E+00
6.101E+01	3.310E+00	6.105E+01	2.490E+00	6.119E+01	5.030E+00
6.127E+01	5.080E+00	6.131E+01	5.920E+00	6.140E+01	5.280E+00
6.145E+01	6.010E+00	6.152E+01	5.350E+00	6.160E+01	6.040E+00
6.165E+01	4.980E+00	6.171E+01	5.170E+00	6.173E+01	4.850E+00
6.179E+01	5.620E+00	6.187E+01	4.550E+00	6.195E+01	5.390E+00
6.200E+01	4.510E+00	6.207E+01	5.450E+00	6.213E+01	4.460E+00
6.218E+01	5.350E+00	6.223E+01	4.910E+00	6.229E+01	5.830E+00
6.235E+01	4.920E+00	6.245E+01	6.520E+00	6.252E+01	5.750E+00
6.262E+01	6.860E+00	6.267E+01	6.630E+00	6.305E+01	1.020E+01
6.307E+01	1.075E+01	6.320E+01	1.082E+01	6.325E+01	1.141E+01
6.330E+01	1.065E+01	6.337E+01	1.185E+01	6.341E+01	1.155E+01
6.344E+01	1.217E+01	6.347E+01	1.210E+01	6.353E+01	1.296E+01
6.367E+01	1.208E+01	6.372E+01	1.318E+01	6.385E+01	1.235E+01
6.393E+01	1.340E+01	6.395E+01	1.305E+01	6.413E+01	1.366E+01
6.420E+01	1.279E+01	6.431E+01	1.373E+01	6.438E+01	1.290E+01
6.449E+01	1.386E+01	6.456E+01	1.291E+01	6.463E+01	1.379E+01
6.470E+01	1.320E+01	6.476E+01	1.432E+01	6.485E+01	1.350E+01
6.490E+01	1.445E+01	6.497E+01	1.371E+01	6.510E+01	1.506E+01
6.516E+01	1.429E+01	6.524E+01	1.480E+01	6.528E+01	1.431E+01
6.536E+01	1.501E+01	6.541E+01	1.402E+01	6.545E+01	1.535E+01
6.552E+01	1.500E+01	6.556E+01	1.577E+01	6.563E+01	1.570E+01
6.568E+01	1.658E+01	6.580E+01	1.580E+01	6.590E+01	1.699E+01
6.600E+01	1.597E+01	6.609E+01	1.696E+01	6.615E+01	1.620E+01
6.625E+01	1.770E+01	6.629E+01	1.764E+01	6.647E+01	2.098E+01
6.705E+01	2.493E+01	6.770E+01	2.962E+01	6.790E+01	2.923E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
18=NODA					
6.030E+01	5.100E-01	6.036E+01	1.320E+00	6.042E+01	1.700E+00
6.047E+01	1.270E+00	6.052E+01	2.110E+00	6.057E+01	1.290E+00
6.061E+01	1.910E+00	6.065E+01	1.500E+00	6.070E+01	2.220E+00
6.074E+01	1.130E+00	6.084E+01	2.110E+00	6.090E+01	1.310E+00
6.093E+01	1.720E+00	6.100E+01	1.170E+00	6.105E+01	1.900E+00
6.110E+01	1.380E+00	6.117E+01	2.210E+00	6.123E+01	1.530E+00
6.128E+01	2.880E+00	6.135E+01	1.510E+00	6.140E+01	2.310E+00
6.148E+01	1.710E+00	6.153E+01	2.400E+00	6.159E+01	1.750E+00
6.162E+01	2.680E+00	6.167E+01	2.110E+00	6.171E+01	2.690E+00
6.174E+01	2.400E+00	6.177E+01	3.120E+00	6.180E+01	2.830E+00
6.190E+01	3.560E+00	6.195E+01	3.220E+00	6.200E+01	3.960E+00
6.204E+01	3.650E+00	6.208E+01	4.600E+00	6.216E+01	4.300E+00
6.223E+01	5.210E+00	6.230E+01	4.690E+00	6.234E+01	5.370E+00
6.242E+01	4.490E+00	6.247E+01	5.350E+00	6.252E+01	4.780E+00
6.259E+01	5.650E+00	6.266E+01	5.090E+00	6.275E+01	6.420E+00
6.282E+01	5.620E+00	6.290E+01	6.410E+00	6.297E+01	5.820E+00
6.302E+01	6.890E+00	6.310E+01	6.100E+00	6.322E+01	7.230E+00
6.329E+01	6.220E+00	6.337E+01	7.650E+00	6.344E+01	7.020E+00
6.350E+01	8.290E+00	6.356E+01	7.480E+00	6.367E+01	9.170E+00
6.375E+01	8.230E+00	6.383E+01	8.810E+00	6.385E+01	8.530E+00
6.390E+01	9.390E+00	6.395E+01	8.820E+00	6.405E+01	9.510E+00
6.409E+01	8.910E+00	6.416E+01	9.910E+00	6.423E+01	9.330E+00
6.431E+01	9.900E+00	6.437E+01	9.200E+00	6.443E+01	9.920E+00
6.450E+01	9.280E+00	6.456E+01	9.920E+00	6.462E+01	9.190E+00
6.467E+01	1.001E+01	6.473E+01	9.500E+00	6.480E+01	1.070E+01
6.491E+01	1.025E+01	6.498E+01	1.118E+01	6.503E+01	1.065E+01
6.513E+01	1.160E+01	6.520E+01	1.102E+01	6.531E+01	1.215E+01
6.537E+01	1.157E+01	6.547E+01	1.244E+01	6.552E+01	1.153E+01
6.562E+01	1.319E+01	6.572E+01	1.258E+01	6.589E+01	1.508E+01
6.611E+01	1.921E+01	6.654E+01	2.053E+01	6.715E+01	2.335E+01
6.815E+01	2.890E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
3A-T					
6.000E+01	8.000E+00				
6.900E+01	5.200E+01				
3A-1					
6.000E+01	6.500E+00	6.030E+01	9.500E+00	6.050E+01	9.700E+00
6.070E+01	8.900E+00	6.080E+01	9.700E+00	6.100E+01	1.280E+01
6.120E+01	1.530E+01	6.160E+01	1.670E+01	6.230E+01	2.000E+01
6.330E+01	2.370E+01	6.380E+01	2.430E+01	6.470E+01	2.550E+01
6.470E+01	2.610E+01	6.480E+01	2.680E+01	6.490E+01	2.940E+01
6.500E+01	3.050E+01	6.520E+01	3.130E+01	6.560E+01	3.220E+01
6.590E+01	3.230E+01	6.610E+01	3.300E+01	6.620E+01	3.380E+01
6.640E+01	3.520E+01	6.680E+01	3.850E+01	6.690E+01	3.950E+01
3A-5					
6.000E+01	6.700E+00	6.050E+01	1.030E+01	6.070E+01	1.000E+01
6.100E+01	1.250E+01	6.140E+01	1.650E+01	6.200E+01	1.850E+01
6.250E+01	2.060E+01	6.300E+01	2.260E+01	6.360E+01	2.300E+01
6.370E+01	2.260E+01	6.390E+01	2.400E+01	6.400E+01	2.340E+01
6.420E+01	2.530E+01	6.430E+01	2.710E+01	6.440E+01	2.890E+01
6.460E+01	3.050E+01	6.490E+01	3.090E+01	6.580E+01	3.170E+01
6.620E+01	3.320E+01	6.650E+01	3.340E+01	6.660E+01	3.270E+01
6.690E+01	3.520E+01	6.730E+01	3.780E+01	6.730E+01	3.840E+01
6.760E+01	3.950E+01				
3A-24					
6.000E+01	6.700E+00	6.020E+01	9.100E+00	6.050E+01	1.010E+01
6.070E+01	9.500E+00	6.080E+01	1.050E+01	6.090E+01	1.160E+01
6.100E+01	1.310E+01	6.120E+01	1.550E+01	6.140E+01	1.640E+01
6.170E+01	1.740E+01	6.240E+01	2.000E+01	6.300E+01	2.240E+01
6.360E+01	2.270E+01	6.390E+01	2.320E+01	6.410E+01	2.480E+01
6.420E+01	2.420E+01	6.420E+01	2.490E+01	6.430E+01	2.620E+01
6.440E+01	2.880E+01	6.460E+01	3.040E+01	6.490E+01	3.160E+01
6.520E+01	3.060E+01	6.570E+01	3.100E+01	6.600E+01	3.190E+01
6.610E+01	3.240E+01	6.640E+01	3.140E+01	6.650E+01	3.140E+01
6.660E+01	3.330E+01	6.670E+01	3.490E+01	6.710E+01	3.800E+01
6.720E+01	3.980E+01	6.720E+01	3.860E+01	6.740E+01	3.840E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
4A-I					
6.000E+01	8.000E+00				
6.900E+01	5.200E+01				
4A-1					
6.000E+01	4.000E-01	6.100E+01	1.140E+01	6.200E+01	2.010E+01
6.240E+01	2.240E+01	6.310E+01	2.410E+01	6.340E+01	2.450E+01
6.350E+01	2.490E+01	6.360E+01	2.580E+01	6.380E+01	2.800E+01
6.400E+01	2.980E+01	6.420E+01	3.060E+01	6.450E+01	3.000E+01
6.470E+01	2.900E+01	6.490E+01	2.930E+01	6.510E+01	3.000E+01
6.540E+01	3.190E+01	6.590E+01	3.380E+01	6.600E+01	3.560E+01
6.650E+01	3.710E+01	6.660E+01	3.760E+01	6.680E+01	3.740E+01
6.700E+01	3.750E+01				
4A-5					
6.000E+01	4.000E-01	6.060E+01	7.600E+00	6.100E+01	1.200E+01
6.140E+01	1.520E+01	6.200E+01	2.080E+01	6.280E+01	2.300E+01
6.330E+01	2.400E+01	6.340E+01	2.360E+01	6.340E+01	2.420E+01
6.350E+01	2.370E+01	6.360E+01	2.480E+01	6.360E+01	2.450E+01
6.370E+01	2.570E+01	6.380E+01	2.500E+01	6.400E+01	2.700E+01
6.410E+01	2.640E+01	6.420E+01	2.760E+01	6.420E+01	2.740E+01
6.440E+01	2.950E+01	6.460E+01	3.070E+01	6.500E+01	3.110E+01
6.540E+01	3.360E+01	6.580E+01	3.530E+01	6.620E+01	3.750E+01
6.640E+01	3.810E+01	6.660E+01	3.790E+01		
4A-24					
6.000E+01	2.800E+00	6.160E+01	1.800E+01	6.170E+01	1.850E+01
6.180E+01	1.840E+01	6.190E+01	1.870E+01	6.200E+01	1.950E+01
6.200E+01	1.920E+01	6.210E+01	1.920E+01	6.220E+01	2.000E+01
6.220E+01	1.960E+01	6.230E+01	1.970E+01	6.230E+01	2.070E+01
6.240E+01	2.000E+01	6.250E+01	2.040E+01	6.260E+01	2.110E+01
6.260E+01	2.060E+01	6.280E+01	2.160E+01	6.280E+01	2.120E+01
6.290E+01	2.240E+01	6.300E+01	2.180E+01	6.320E+01	2.310E+01
6.320E+01	2.230E+01	6.370E+01	2.670E+01	6.420E+01	3.050E+01
6.440E+01	3.120E+01	6.470E+01	2.940E+01	6.480E+01	2.940E+01
6.500E+01	3.100E+01	6.530E+01	3.160E+01	6.550E+01	3.250E+01
6.590E+01	3.280E+01	6.600E+01	3.370E+01	6.640E+01	3.590E+01
6.670E+01	3.830E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
5A-T					
6.000E+01	8.000E+00				
6.900E+01	5.200E+01				
5A-1					
6.000E+01	7.400E+00	6.070E+01	1.020E+01	6.120E+01	1.580E+01
6.180E+01	1.780E+01	6.190E+01	1.880E+01	6.210E+01	1.840E+01
6.220E+01	1.950E+01	6.240E+01	1.870E+01	6.240E+01	2.000E+01
6.230E+01	1.950E+01	6.280E+01	1.920E+01	6.290E+01	2.000E+01
6.300E+01	2.180E+01	6.310E+01	2.180E+01	6.320E+01	2.320E+01
6.330E+01	2.220E+01	6.350E+01	2.380E+01	6.360E+01	2.240E+01
6.370E+01	2.400E+01	6.380E+01	2.260E+01	6.390E+01	2.400E+01
6.400E+01	2.300E+01	6.410E+01	2.440E+01	6.420E+01	2.460E+01
6.430E+01	2.390E+01	6.440E+01	2.550E+01	6.500E+01	2.300E+01
6.530E+01	2.390E+01	6.540E+01	2.520E+01	6.580E+01	2.950E+01
6.580E+01	3.070E+01	6.590E+01	3.220E+01	6.620E+01	3.450E+01
6.740E+01	4.460E+01				
5A-5					
6.000E+01	6.800E+00	6.050E+01	1.010E+01	6.070E+01	1.020E+01
6.100E+01	1.350E+01	6.120E+01	1.600E+01	6.190E+01	1.800E+01
6.230E+01	1.620E+01	6.240E+01	1.740E+01	6.250E+01	1.740E+01
6.250E+01	1.700E+01	6.260E+01	1.730E+01	6.270E+01	1.890E+01
6.290E+01	2.020E+01	6.290E+01	2.180E+01	6.300E+01	2.110E+01
6.320E+01	2.230E+01	6.330E+01	2.070E+01	6.340E+01	2.130E+01
6.340E+01	2.050E+01	6.360E+01	2.240E+01	6.360E+01	2.220E+01
6.370E+01	2.080E+01	6.380E+01	2.220E+01	6.390E+01	2.200E+01
6.390E+01	2.120E+01	6.400E+01	2.260E+01	6.410E+01	2.180E+01
6.430E+01	2.280E+01	6.440E+01	2.230E+01	6.490E+01	2.200E+01
6.510E+01	2.390E+01	6.540E+01	3.020E+01	6.580E+01	3.300E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
5A-19					
6.000E+01	7.100E+00	6.050E+01	9.600E+00	6.070E+01	9.200E+00
6.080E+01	1.000E+01	6.100E+01	1.370E+01	6.150E+01	1.670E+01
6.180E+01	1.710E+01	6.210E+01	1.640E+01	6.230E+01	1.610E+01
6.240E+01	1.730E+01	6.240E+01	1.700E+01	6.250E+01	1.670E+01
6.270E+01	1.510E+01	6.280E+01	1.820E+01	6.290E+01	1.900E+01
6.290E+01	1.810E+01	6.300E+01	1.840E+01	6.310E+01	1.770E+01
6.320E+01	1.920E+01	6.330E+01	1.940E+01	6.340E+01	1.840E+01
6.340E+01	1.920E+01	6.360E+01	1.830E+01	6.370E+01	1.950E+01
6.380E+01	1.870E+01	6.390E+01	2.010E+01	6.400E+01	1.920E+01
6.410E+01	2.040E+01	6.430E+01	1.950E+01	6.430E+01	2.060E+01
6.450E+01	2.000E+01	6.460E+01	2.080E+01	6.480E+01	2.290E+01
6.500E+01	2.720E+01	6.520E+01	2.940E+01	6.560E+01	3.480E+01
6.630E+01	3.770E+01	6.700E+01	4.330E+01	6.700E+01	4.420E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
6A-I					
6.000E+01	8.000E+00				
6.900E+01	5.200E+01				
6A-1					
6.000E+01	3.400E+00	6.100E+01	1.380E+01	6.180E+01	1.860E+01
6.180E+01	1.930E+01	6.200E+01	1.910E+01	6.200E+01	1.980E+01
6.210E+01	1.910E+01	6.220E+01	2.010E+01	6.230E+01	1.940E+01
6.240E+01	2.070E+01	6.250E+01	1.980E+01	6.260E+01	2.060E+01
6.260E+01	2.040E+01	6.270E+01	2.150E+01	6.280E+01	2.080E+01
6.290E+01	2.240E+01	6.300E+01	2.140E+01	6.320E+01	2.300E+01
6.330E+01	2.220E+01	6.340E+01	2.380E+01	6.350E+01	2.310E+01
6.360E+01	2.430E+01	6.370E+01	2.400E+01	6.390E+01	2.500E+01
6.400E+01	2.460E+01	6.410E+01	2.350E+01	6.420E+01	2.480E+01
6.440E+01	2.610E+01	6.460E+01	2.530E+01	6.470E+01	2.600E+01
6.540E+01	3.270E+01	6.690E+01	4.180E+01		
6A-5					
6.000E+01	3.600E+00	6.130E+01	1.680E+01	6.140E+01	1.680E+01
6.140E+01	1.740E+01	6.150E+01	1.670E+01	6.170E+01	1.760E+01
6.170E+01	1.710E+01	6.180E+01	1.800E+01	6.190E+01	1.720E+01
6.200E+01	1.720E+01	6.200E+01	1.800E+01	6.210E+01	1.730E+01
6.220E+01	1.810E+01	6.230E+01	1.770E+01	6.230E+01	1.790E+01
6.240E+01	1.870E+01	6.250E+01	1.800E+01	6.260E+01	1.860E+01
6.270E+01	1.920E+01	6.290E+01	1.910E+01	6.290E+01	1.980E+01
6.300E+01	1.930E+01	6.310E+01	2.070E+01	6.330E+01	2.020E+01
6.340E+01	2.040E+01	6.350E+01	2.070E+01	6.360E+01	2.220E+01
6.370E+01	2.160E+01	6.380E+01	2.350E+01	6.390E+01	2.310E+01
6.400E+01	2.470E+01	6.410E+01	2.460E+01	6.460E+01	2.940E+01
6.570E+01	3.550E+01	6.630E+01	3.880E+01	6.770E+01	4.120E+01
6A-19					
6.000E+01	3.000E+00	6.120E+01	1.580E+01	6.140E+01	1.550E+01
6.150E+01	1.610E+01	6.150E+01	1.580E+01	6.170E+01	1.660E+01
6.170E+01	1.600E+01	6.180E+01	1.700E+01	6.190E+01	1.820E+01
6.200E+01	1.740E+01	6.210E+01	1.660E+01	6.220E+01	1.760E+01
6.230E+01	1.690E+01	6.240E+01	1.810E+01	6.250E+01	1.730E+01
6.260E+01	1.850E+01	6.270E+01	1.770E+01	6.280E+01	1.910E+01
6.290E+01	1.850E+01	6.300E+01	1.970E+01	6.310E+01	1.930E+01
6.320E+01	2.050E+01	6.330E+01	1.980E+01	6.340E+01	2.140E+01
6.350E+01	2.090E+01	6.370E+01	2.280E+01	6.380E+01	2.260E+01
6.460E+01	3.020E+01	6.510E+01	3.300E+01	6.590E+01	3.680E+01
6.660E+01	4.190E+01	6.680E+01	4.230E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
7A-T					
6.170E+01	1.720E+01	6.700E+01	3.620E+01	6.790E+01	4.660E+01
7A-1					
6.000E+01	7.500E+00	6.020E+01	9.300E+00	6.050E+01	1.150E+01
6.060E+01	1.260E+01	6.070E+01	1.200E+01	6.080E+01	1.370E+01
6.090E+01	1.330E+01	6.100E+01	1.420E+01	6.100E+01	1.470E+01
6.110E+01	1.450E+01	6.110E+01	1.510E+01	6.120E+01	1.510E+01
6.120E+01	1.590E+01	6.130E+01	1.530E+01	6.140E+01	1.680E+01
6.160E+01	1.740E+01	6.180E+01	1.610E+01	6.190E+01	1.510E+01
6.200E+01	1.460E+01	6.210E+01	1.580E+01	6.220E+01	1.550E+01
6.220E+01	1.560E+01	6.240E+01	1.850E+01	6.250E+01	1.840E+01
6.270E+01	2.130E+01	6.290E+01	2.060E+01	6.310E+01	2.310E+01
6.330E+01	2.100E+01	6.330E+01	2.080E+01	6.350E+01	2.250E+01
6.360E+01	2.140E+01	6.390E+01	2.500E+01	6.400E+01	2.540E+01
6.420E+01	2.860E+01	6.430E+01	2.910E+01	6.450E+01	2.910E+01
6.490E+01	2.670E+01	6.520E+01	2.750E+01	6.540E+01	3.140E+01
6.560E+01	3.200E+01	6.560E+01	3.300E+01	6.630E+01	3.810E+01
6.690E+01	4.360E+01				
7A-5					
6.000E+01	7.900E+00	6.030E+01	8.200E+00	6.050E+01	1.080E+01
6.070E+01	1.250E+01	6.080E+01	1.260E+01	6.090E+01	1.390E+01
6.090E+01	1.360E+01	6.100E+01	1.450E+01	6.110E+01	1.410E+01
6.120E+01	1.550E+01	6.120E+01	1.540E+01	6.130E+01	1.610E+01
6.150E+01	1.580E+01	6.160E+01	1.660E+01	6.190E+01	1.400E+01
6.190E+01	1.470E+01	6.200E+01	1.410E+01	6.210E+01	1.510E+01
6.220E+01	1.540E+01	6.230E+01	1.800E+01	6.260E+01	1.850E+01
6.260E+01	1.910E+01	6.270E+01	2.150E+01	6.290E+01	2.100E+01
6.290E+01	2.100E+01	6.310E+01	2.270E+01	6.330E+01	2.080E+01
6.330E+01	2.020E+01	6.350E+01	2.180E+01	6.360E+01	2.090E+01
6.370E+01	2.060E+01	6.380E+01	2.240E+01	6.380E+01	2.140E+01
6.410E+01	2.780E+01	6.440E+01	2.940E+01	6.490E+01	2.890E+01
6.510E+01	2.770E+01	6.520E+01	2.870E+01	6.540E+01	3.170E+01
6.550E+01	3.200E+01	6.560E+01	3.320E+01	6.620E+01	3.810E+01
6.680E+01	4.410E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
7A-15					
6.000E+01	5.900E+00	6.020E+01	7.800E+00	6.040E+01	1.020E+01
6.060E+01	1.170E+01	6.080E+01	1.200E+01	6.100E+01	1.230E+01
6.110E+01	1.120E+01	6.120E+01	1.240E+01	6.140E+01	1.150E+01
6.150E+01	1.230E+01	6.160E+01	1.140E+01	6.170E+01	1.270E+01
6.180E+01	1.230E+01	6.180E+01	1.320E+01	6.190E+01	1.570E+01
6.210E+01	1.570E+01	6.230E+01	1.740E+01	6.240E+01	1.640E+01
6.250E+01	1.800E+01	6.270E+01	1.600E+01	6.280E+01	1.720E+01
6.290E+01	1.570E+01	6.310E+01	1.700E+01	6.320E+01	1.580E+01
6.330E+01	1.660E+01	6.330E+01	1.600E+01	6.350E+01	1.840E+01
6.360E+01	1.820E+01	6.370E+01	1.720E+01	6.380E+01	1.920E+01
6.390E+01	1.850E+01	6.440E+01	2.790E+01	6.530E+01	3.470E+01
6.660E+01	4.540E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
BA-T					
6.170E+01	1.720E+01	6.700E+01	3.620E+01	6.790E+01	4.660E+01
BA-1					
6.000E+01	3.400E+00	6.070E+01	1.150E+01	6.120E+01	1.320E+01
6.120E+01	1.450E+01	6.140E+01	1.640E+01	6.150E+01	1.560E+01
6.150E+01	1.590E+01	6.160E+01	1.680E+01	6.170E+01	1.600E+01
6.180E+01	1.740E+01	6.190E+01	1.640E+01	6.210E+01	1.790E+01
6.220E+01	1.710E+01	6.240E+01	1.890E+01	6.250E+01	1.780E+01
6.260E+01	1.970E+01	6.270E+01	1.900E+01	6.280E+01	2.060E+01
6.290E+01	1.960E+01	6.310E+01	2.180E+01	6.320E+01	2.100E+01
6.340E+01	2.270E+01	6.350E+01	2.180E+01	6.370E+01	2.280E+01
6.380E+01	2.400E+01	6.430E+01	2.920E+01	6.470E+01	3.090E+01
6.500E+01	3.240E+01	6.610E+01	3.750E+01	6.690E+01	4.180E+01
BA-5					
6.000E+01	4.800E+00	6.050E+01	1.080E+01	6.060E+01	1.050E+01
6.100E+01	1.260E+01	6.110E+01	1.520E+01	6.120E+01	1.560E+01
6.120E+01	1.580E+01	6.140E+01	1.560E+01	6.140E+01	1.460E+01
6.160E+01	1.600E+01	6.170E+01	1.540E+01	6.190E+01	1.670E+01
6.200E+01	1.620E+01	6.210E+01	1.780E+01	6.220E+01	1.710E+01
6.230E+01	1.860E+01	6.240E+01	1.790E+01	6.250E+01	1.990E+01
6.270E+01	1.920E+01	6.280E+01	2.120E+01	6.290E+01	2.080E+01
6.310E+01	2.330E+01	6.320E+01	2.300E+01	6.380E+01	2.900E+01
6.420E+01	3.030E+01	6.480E+01	2.880E+01	6.490E+01	2.930E+01
6.510E+01	2.870E+01	6.560E+01	3.290E+01	6.690E+01	4.170E+01
BA-15					
6.000E+01	6.500E+00	6.020E+01	7.200E+00	6.030E+01	8.400E+00
6.030E+01	7.900E+00	6.050E+01	8.800E+00	6.060E+01	1.040E+01
6.070E+01	9.800E+00	6.100E+01	1.170E+01	6.100E+01	1.130E+01
6.110E+01	1.160E+01	6.120E+01	1.280E+01	6.130E+01	1.220E+01
6.140E+01	1.370E+01	6.150E+01	1.320E+01	6.160E+01	1.470E+01
6.170E+01	1.430E+01	6.190E+01	1.620E+01	6.200E+01	1.580E+01
6.220E+01	1.750E+01	6.230E+01	1.660E+01	6.240E+01	1.820E+01
6.250E+01	1.810E+01	6.260E+01	1.940E+01	6.270E+01	1.850E+01
6.290E+01	2.110E+01	6.310E+01	2.010E+01	6.340E+01	2.390E+01
6.390E+01	2.830E+01	6.450E+01	2.980E+01	6.590E+01	2.880E+01
6.610E+01	3.610E+01	6.710E+01	4.230E+01	6.730E+01	4.090E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
9A-1					
6.000E+01	8.200E+00	6.020E+01	1.030E+01	6.030E+01	8.300E+00
6.040E+01	9.200E+00	6.060E+01	1.190E+01	6.070E+01	1.110E+01
6.090E+01	1.230E+01	6.120E+01	1.410E+01	6.140E+01	1.480E+01
6.170E+01	1.440E+01	6.180E+01	1.320E+01	6.190E+01	1.400E+01
6.200E+01	1.280E+01	6.220E+01	1.470E+01	6.230E+01	1.530E+01
6.240E+01	1.780E+01	6.260E+01	1.800E+01	6.280E+01	2.050E+01
6.290E+01	1.920E+01	6.310E+01	2.090E+01	6.320E+01	2.280E+01
6.340E+01	2.060E+01	6.350E+01	2.090E+01	6.390E+01	2.470E+01
6.400E+01	2.320E+01	6.430E+01	2.740E+01	6.440E+01	2.830E+01
6.450E+01	2.920E+01	6.470E+01	2.920E+01	6.520E+01	2.740E+01
6.530E+01	2.760E+01	6.560E+01	3.080E+01	6.580E+01	3.220E+01
6.600E+01	3.350E+01	6.650E+01	3.780E+01	6.720E+01	4.470E+01
6.750E+01	4.320E+01	6.760E+01	4.320E+01	6.770E+01	4.430E+01
6.780E+01	4.560E+01				
9A-5					
6.000E+01	6.200E+00	6.020E+01	8.200E+00	6.030E+01	7.200E+00
6.050E+01	9.200E+00	6.060E+01	8.800E+00	6.080E+01	1.100E+01
6.090E+01	9.900E+00	6.100E+01	1.200E+01	6.110E+01	1.040E+01
6.130E+01	1.220E+01	6.140E+01	1.120E+01	6.160E+01	1.380E+01
6.160E+01	1.240E+01	6.190E+01	1.510E+01	6.200E+01	1.450E+01
6.220E+01	1.660E+01	6.230E+01	1.500E+01	6.260E+01	1.780E+01
6.270E+01	1.650E+01	6.290E+01	2.000E+01	6.300E+01	1.840E+01
6.350E+01	2.370E+01	6.360E+01	2.400E+01	6.430E+01	2.910E+01
6.500E+01	2.910E+01	6.610E+01	3.540E+01	6.730E+01	4.210E+01
6.750E+01	4.390E+01	6.780E+01	4.160E+01		
9A-20 Breaker @ 64.50 Breaker height 7.5 cm					
6.000E+01	7.500E+00	6.020E+01	8.200E+00	6.040E+01	6.800E+00
6.050E+01	8.300E+00	6.060E+01	7.500E+00	6.070E+01	8.800E+00
6.080E+01	7.900E+00	6.090E+01	9.400E+00	6.100E+01	8.500E+00
9.110E+01	9.900E+00	6.120E+01	9.400E+00	6.130E+01	1.090E+01
6.140E+01	1.020E+01	6.150E+01	1.110E+01	6.160E+01	1.110E+01
6.160E+01	1.210E+01	6.170E+01	1.170E+01	6.180E+01	1.290E+01
6.190E+01	1.260E+01	6.200E+01	1.430E+01	6.210E+01	1.410E+01
6.220E+01	1.620E+01	6.240E+01	1.680E+01	6.250E+01	2.010E+01
6.270E+01	2.000E+01	6.290E+01	2.200E+01	6.310E+01	2.010E+01
6.340E+01	2.430E+01	6.370E+01	2.180E+01	6.400E+01	2.650E+01
6.450E+01	2.900E+01	6.520E+01	2.760E+01	6.600E+01	3.480E+01
6.730E+01	4.610E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
9A-23 Breaker @ 64.70 Breaker height 9.9 cm					
6.000E+01	8.800E+00	6.010E+01	9.300E+00	6.020E+01	7.300E+00
6.040E+01	8.800E+00	6.050E+01	7.600E+00	6.060E+01	9.200E+00
6.070E+01	7.900E+00	6.090E+01	9.700E+00	6.100E+01	8.800E+00
6.110E+01	1.040E+01	6.130E+01	9.400E+00	6.140E+01	1.120E+01
6.150E+01	1.050E+01	6.160E+01	1.200E+01	6.170E+01	1.120E+01
6.180E+01	1.280E+01	6.190E+01	1.250E+01	6.200E+01	1.450E+01
6.210E+01	1.400E+01	6.240E+01	1.780E+01	6.250E+01	1.810E+01
6.270E+01	2.080E+01	6.280E+01	2.060E+01	6.310E+01	2.310E+01
6.330E+01	2.150E+01	6.360E+01	2.460E+01	6.380E+01	2.230E+01
6.410E+01	2.720E+01	6.440E+01	2.890E+01	6.520E+01	2.760E+01
6.610E+01	3.540E+01	6.720E+01	4.330E+01	6.730E+01	4.570E+01
9A-26 Breaker @ 64.6 Breaker height 10 cm					
6.000E+01	8.600E+00	6.020E+01	6.800E+00	6.030E+01	8.300E+00
6.040E+01	7.200E+00	6.050E+01	8.400E+00	6.060E+01	7.400E+00
6.080E+01	9.000E+00	6.090E+01	8.200E+00	6.110E+01	1.020E+01
6.120E+01	9.100E+00	6.130E+01	1.060E+01	6.140E+01	1.020E+01
6.140E+01	1.080E+01	6.150E+01	1.080E+01	6.160E+01	1.200E+01
6.170E+01	1.160E+01	6.190E+01	1.350E+01	6.200E+01	1.280E+01
6.210E+01	1.480E+01	6.220E+01	1.510E+01	6.230E+01	1.820E+01
6.260E+01	1.840E+01	6.270E+01	2.120E+01	6.290E+01	1.970E+01
6.330E+01	2.380E+01	6.350E+01	2.210E+01	6.380E+01	2.520E+01
6.390E+01	2.390E+01	6.430E+01	2.860E+01	6.480E+01	2.880E+01
6.510E+01	2.640E+01	6.550E+01	3.060E+01	6.620E+01	3.570E+01
6.730E+01	4.540E+01	6.740E+01	4.650E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
10A-1					
6.000E+01	1.020E+01	6.010E+01	1.180E+01	6.030E+01	1.070E+01
6.050E+01	1.210E+01	6.050E+01	1.290E+01	6.060E+01	1.190E+01
6.080E+01	1.320E+01	6.090E+01	1.280E+01	6.110E+01	1.440E+01
6.130E+01	1.460E+01	6.140E+01	1.550E+01	6.160E+01	1.470E+01
6.170E+01	1.610E+01	6.180E+01	1.500E+01	6.200E+01	1.680E+01
6.210E+01	1.600E+01	6.230E+01	1.780E+01	6.240E+01	1.680E+01
6.260E+01	1.920E+01	6.280E+01	1.790E+01	6.300E+01	2.040E+01
6.310E+01	1.910E+01	6.330E+01	2.150E+01	6.350E+01	2.040E+01
6.370E+01	2.230E+01	6.380E+01	2.250E+01	6.400E+01	2.450E+01
6.410E+01	2.480E+01	6.440E+01	2.840E+01	6.470E+01	2.910E+01
6.530E+01	3.120E+01	6.600E+01	3.490E+01	6.730E+01	4.090E+01
6.780E+01	4.160E+01	6.780E+01	4.620E+01		
10A-5					
6.000E+01	9.600E+00	6.020E+01	7.700E+00	6.030E+01	7.900E+00
6.050E+01	7.400E+00	6.070E+01	9.200E+00	6.070E+01	8.100E+00
6.090E+01	9.100E+00	6.100E+01	8.100E+00	6.110E+01	1.010E+01
6.120E+01	8.800E+00	6.140E+01	1.060E+01	6.150E+01	9.900E+00
6.160E+01	1.100E+01	6.170E+01	1.050E+01	6.180E+01	1.210E+01
6.190E+01	1.160E+01	6.200E+01	1.340E+01	6.210E+01	1.300E+01
6.220E+01	1.650E+01	6.240E+01	1.700E+01	6.250E+01	1.770E+01
6.260E+01	2.050E+01	6.280E+01	2.070E+01	6.300E+01	2.260E+01
6.320E+01	2.050E+01	6.320E+01	2.050E+01	6.350E+01	2.360E+01
6.360E+01	2.200E+01	6.370E+01	2.200E+01	6.390E+01	2.540E+01
6.400E+01	2.520E+01	6.420E+01	2.790E+01	6.450E+01	2.880E+01
6.470E+01	2.880E+01	6.490E+01	2.740E+01	6.510E+01	2.720E+01
6.520E+01	2.810E+01	6.540E+01	3.040E+01	6.560E+01	3.120E+01
6.580E+01	3.230E+01	6.600E+01	3.440E+01	6.640E+01	3.760E+01
6.710E+01	4.370E+01	6.720E+01	4.520E+01	6.760E+01	4.330E+01
6.770E+01	4.390E+01	6.780E+01	4.520E+01	6.800E+01	4.760E+01
10A-20 Breaker @ 63.8 Breaker height 9.3 cm					
6.000E+01	7.000E+00	6.010E+01	7.700E+00	6.020E+01	7.100E+00
6.040E+01	9.100E+00	6.050E+01	8.600E+00	6.070E+01	1.070E+01
6.080E+01	9.800E+00	6.110E+01	1.230E+01	6.120E+01	1.200E+01
6.140E+01	1.400E+01	6.150E+01	1.300E+01	6.210E+01	1.810E+01
6.220E+01	1.790E+01	6.290E+01	2.570E+01	6.340E+01	2.740E+01
6.390E+01	2.630E+01	6.440E+01	2.500E+01	6.520E+01	2.530E+01
6.560E+01	2.780E+01	6.680E+01	3.530E+01	6.800E+01	4.260E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
10A-23Breaker @ 63.8 Breaker height 9.6 cm					
6.000E+01	6.800E+00	6.020E+01	8.400E+00	6.030E+01	8.000E+00
6.060E+01	1.100E+01	6.070E+01	1.030E+01	6.090E+01	1.180E+01
6.100E+01	1.130E+01	6.120E+01	1.340E+01	6.130E+01	1.300E+01
6.160E+01	1.600E+01	6.180E+01	1.510E+01	6.210E+01	1.880E+01
6.230E+01	1.740E+01	6.260E+01	2.040E+01	6.270E+01	1.920E+01
6.310E+01	2.320E+01	6.340E+01	2.440E+01	6.380E+01	2.760E+01
6.440E+01	2.800E+01	6.500E+01	2.610E+01	6.530E+01	2.830E+01
6.590E+01	2.850E+01	6.700E+01	3.580E+01	6.800E+01	4.240E+01
10A-26Breaker @ 63.8 Breaker height 9.4 cm					
6.000E+01	6.400E+00	6.020E+01	8.000E+00	6.030E+01	7.600E+00
6.040E+01	9.000E+00	6.050E+01	8.200E+00	6.070E+01	1.000E+01
6.070E+01	9.200E+00	6.090E+01	1.120E+01	6.100E+01	1.050E+01
6.130E+01	1.300E+01	6.140E+01	1.210E+01	6.170E+01	1.580E+01
6.180E+01	1.440E+01	6.230E+01	1.960E+01	6.240E+01	1.870E+01
6.300E+01	2.560E+01	6.350E+01	2.820E+01	6.400E+01	2.610E+01
6.440E+01	2.460E+01	6.480E+01	2.570E+01	6.560E+01	2.730E+01
6.590E+01	3.100E+01	6.690E+01	3.530E+01	6.800E+01	4.170E+01
6.160E+01	1.730E+01	6.780E+01	4.040E+01		
11A-I Collapsing Breaker @ 66.4					
6.160E+01	1.730E+01	6.780E+01	4.040E+01		
11A-1 Collapsing Breaker @ 66.5 Breaker height small					
6.400E+01	2.600E+01	6.450E+01	2.740E+01	6.480E+01	2.900E+01
6.550E+01	3.120E+01	6.600E+01	3.210E+01	6.610E+01	3.220E+01
6.620E+01	3.380E+01	6.650E+01	3.540E+01	6.670E+01	3.520E+01
6.790E+01	4.110E+01				
11A-5 Collapsing Breaker @ 66.5 Breaker height small					
6.400E+01	2.580E+01	6.450E+01	2.760E+01	6.510E+01	2.980E+01
6.550E+01	3.100E+01	6.590E+01	3.220E+01	6.610E+01	3.190E+01
6.620E+01	3.310E+01	6.620E+01	3.570E+01	6.680E+01	3.540E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
12A-1 Collapsing Breaker @ 66.2					
6.160E+01	1.730E+01	6.780E+01	4.040E+01		
12A-1 Collapsing Breaker @ 66.25		Breaker height small			
6.400E+01	2.690E+01	6.430E+01	2.810E+01	6.460E+01	2.940E+01
6.550E+01	3.170E+01	6.560E+01	3.260E+01	6.580E+01	3.250E+01
6.590E+01	3.230E+01	6.600E+01	3.340E+01	6.630E+01	3.560E+01
6.640E+01	3.500E+01	6.700E+01	3.660E+01	6.750E+01	3.910E+01
6.800E+01	4.120E+01				
12A-5 Collapsing Breaker @ 66.5		Breaker height small			
6.400E+01	2.720E+01	6.440E+01	2.810E+01	6.460E+01	2.940E+01
6.490E+01	3.000E+01	6.520E+01	3.060E+01	6.550E+01	3.160E+01
6.560E+01	3.250E+01	6.590E+01	3.240E+01	6.600E+01	3.330E+01
6.640E+01	3.570E+01	6.650E+01	3.510E+01		
13A-1					
6.160E+01	1.730E+01	6.780E+01	4.040E+01		
13A-1 Collapsing Breaker @ 65.2		Breaker height 2.6 cm			
6.350E+01	2.380E+01	6.400E+01	2.580E+01	6.440E+01	2.710E+01
6.480E+01	2.760E+01	6.510E+01	2.850E+01	6.510E+01	2.960E+01
6.530E+01	3.080E+01	6.550E+01	3.140E+01	6.560E+01	3.120E+01
6.590E+01	3.290E+01	6.620E+01	3.520E+01	6.640E+01	3.430E+01
13A-5 Collapsing Breaker @ 65.1		Breaker height 2.3 cm			
6.350E+01	2.380E+01	6.410E+01	2.610E+01	6.440E+01	2.690E+01
6.480E+01	2.700E+01	6.500E+01	2.740E+01	6.520E+01	3.010E+01
6.560E+01	3.120E+01	6.620E+01	3.560E+01		
13A-23 Collapsing Breaker @ 65.0		Breaker height 2.3 cm			
6.350E+01	2.370E+01	6.400E+01	2.580E+01	6.470E+01	2.640E+01
6.480E+01	2.680E+01	6.510E+01	3.000E+01	6.530E+01	3.070E+01
6.560E+01	3.180E+01	6.600E+01	3.400E+01	6.620E+01	3.550E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
14A-1					
6.160E+01	1.730E+01	6.780E+01	4.040E+01		
14A-1 Collapsing Breaker @ 65.1		Breaker height 2.6 cm			
6.350E+01	2.500E+01	6.380E+01	2.600E+01	6.380E+01	2.640E+01
6.390E+01	2.660E+01	6.400E+01	2.760E+01	6.400E+01	2.680E+01
6.410E+01	2.740E+01	6.420E+01	2.680E+01	6.420E+01	2.730E+01
6.430E+01	2.680E+01	6.430E+01	2.750E+01	6.430E+01	2.710E+01
6.440E+01	2.790E+01	6.440E+01	2.740E+01	6.450E+01	2.840E+01
6.450E+01	2.800E+01	6.460E+01	2.840E+01	6.470E+01	2.900E+01
6.470E+01	2.900E+01	6.480E+01	2.960E+01	6.480E+01	2.880E+01
6.490E+01	2.960E+01	6.490E+01	2.900E+01	6.500E+01	2.960E+01
6.500E+01	2.900E+01	6.510E+01	3.030E+01	6.550E+01	3.020E+01
6.560E+01	3.170E+01	6.580E+01	3.370E+01	6.590E+01	3.500E+01
6.610E+01	3.370E+01				
14A-5 Collapsing Breaker @ 64.95		Breaker height 1.9 cm			
6.350E+01	1.380E+01	6.390E+01	1.560E+01	6.500E+01	1.750E+01
6.500E+01	1.770E+01	6.510E+01	1.930E+01	6.550E+01	2.080E+01
6.600E+01	2.340E+01				
14A-23 Collapsing Breaker @ 65.0		Breaker height 2.3 cm			
6.350E+01	2.500E+01	6.400E+01	2.730E+01	6.440E+01	2.720E+01
6.450E+01	2.720E+01	6.470E+01	2.640E+01	6.490E+01	2.740E+01
6.510E+01	3.000E+01	6.550E+01	3.230E+01	6.600E+01	3.470E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
15A-I					
6.160E+01	1.730E+01	6.780E+01	4.040E+01		
15A-1 Surging Breaker @ 66.5		Breaker height 2.6 cm			
6.200E+01	1.530E+01	6.290E+01	1.780E+01	6.390E+01	1.980E+01
6.440E+01	2.130E+01	6.510E+01	2.470E+01	6.550E+01	2.740E+01
6.580E+01	2.880E+01	6.600E+01	2.830E+01	6.620E+01	2.920E+01
6.640E+01	3.050E+01	6.660E+01	3.250E+01	6.670E+01	3.450E+01
6.680E+01	3.310E+01				
15A-5 Surging Breaker @ 66.2		Breaker height 1.9 cm			
6.100E+01	1.140E+01	6.250E+01	1.660E+01	6.370E+01	1.930E+01
6.470E+01	2.230E+01	6.560E+01	2.750E+01	6.610E+01	2.870E+01
6.640E+01	3.030E+01	6.660E+01	3.210E+01	6.670E+01	3.380E+01
15A-23 Surging Breaker @ 66.55		Breaker height 2.6 cm			
6.100E+01	1.210E+01	6.200E+01	1.550E+01	6.290E+01	1.780E+01
6.350E+01	1.880E+01	6.390E+01	1.970E+01	6.430E+01	2.060E+01
6.470E+01	2.280E+01	6.520E+01	2.480E+01	6.540E+01	2.670E+01
6.560E+01	2.740E+01	6.580E+01	2.820E+01	6.600E+01	2.810E+01
6.600E+01	2.840E+01	6.610E+01	2.850E+01	6.620E+01	2.940E+01
6.640E+01	3.060E+01	6.660E+01	3.180E+01	6.670E+01	3.410E+01
6.690E+01	3.320E+01	6.710E+01	3.410E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
16A-T					
6.160E+01	1.730E+01	6.780E+01	4.040E+01		
16A-1 Surging Breaker @ 63.05		Breaker height 1.5 cm			
6.200E+01	1.580E+01	6.300E+01	2.050E+01	6.350E+01	2.300E+01
6.430E+01	2.840E+01	6.440E+01	2.840E+01	6.560E+01	2.820E+01
6.570E+01	2.770E+01	6.580E+01	2.800E+01	6.630E+01	3.260E+01
6.640E+01	3.440E+01	6.650E+01	3.300E+01		
16A-5 Surging Breaker @ 64.9		Breaker height 1.9 cm			
6.100E+01	8.200E+00	6.200E+01	1.480E+01	6.300E+01	2.040E+01
6.400E+01	2.620E+01	6.430E+01	2.780E+01	6.470E+01	2.800E+01
6.530E+01	3.200E+01	6.540E+01	3.460E+01		
16A-23 Surging Breaker @ 65.2		Breaker height 2.5 cm			
6.100E+01	8.200E+00	6.150E+01	1.170E+01	6.200E+01	1.550E+01
6.260E+01	1.800E+01	6.300E+01	2.000E+01	6.340E+01	2.270E+01
6.380E+01	2.480E+01	6.420E+01	2.740E+01	6.440E+01	2.770E+01
6.460E+01	2.760E+01	6.470E+01	2.780E+01	6.480E+01	2.830E+01
6.490E+01	2.970E+01	6.510E+01	3.080E+01	6.520E+01	3.140E+01
6.530E+01	3.180E+01	6.540E+01	3.240E+01	6.540E+01	3.380E+01
6.550E+01	3.300E+01	6.560E+01	3.270E+01	6.580E+01	3.300E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
17A-1					
6.100E+01	6.400E+00	6.130E+01	1.100E+01	6.400E+01	2.220E+01
6.710E+01	3.300E+01	6.760E+01	3.490E+01	6.790E+01	3.970E+01
17A-1 Collapsing Breaker @ 66.05		Breaker height 5 cm			
6.100E+01	6.800E+00	6.130E+01	1.120E+01	6.180E+01	1.380E+01
6.210E+01	1.540E+01	6.300E+01	1.940E+01	6.400E+01	2.200E+01
6.450E+01	2.320E+01	6.480E+01	2.340E+01	6.510E+01	2.360E+01
6.540E+01	2.500E+01	6.560E+01	2.720E+01	6.590E+01	2.920E+01
6.610E+01	3.080E+01	6.650E+01	3.220E+01	6.670E+01	3.360E+01
6.670E+01	3.550E+01	6.720E+01	3.380E+01		
17A-5 Collapsing Breaker @ 66.05		Breaker height 5.3 cm			
6.100E+01	5.800E+00	6.130E+01	1.120E+01	6.180E+01	1.370E+01
6.240E+01	1.710E+01	6.260E+01	1.870E+01	6.330E+01	1.970E+01
6.420E+01	2.240E+01	6.450E+01	2.300E+01	6.480E+01	2.320E+01
6.510E+01	2.350E+01	6.540E+01	2.550E+01	6.570E+01	2.820E+01
6.600E+01	3.060E+01	6.620E+01	3.130E+01	6.660E+01	3.230E+01
6.670E+01	3.330E+01	6.680E+01	3.540E+01	6.710E+01	3.370E+01
17A-22 Collapsing Breaker @ 66.0		Breaker height 4.7 cm			
6.100E+01	7.100E+00	6.130E+01	8.600E+00	6.160E+01	1.240E+01
6.180E+01	1.380E+01	6.210E+01	1.500E+01	6.230E+01	1.640E+01
6.280E+01	1.840E+01	6.340E+01	2.000E+01	6.400E+01	2.170E+01
6.450E+01	2.280E+01	6.490E+01	2.320E+01	6.510E+01	2.380E+01
6.550E+01	2.640E+01	6.600E+01	2.980E+01	6.630E+01	3.090E+01
6.660E+01	3.220E+01	6.680E+01	3.340E+01	6.690E+01	3.540E+01
6.700E+01	3.380E+01	6.720E+01	3.340E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
18A=1					
6.100E+01	1.230E+01	6.470E+01	2.470E+01	6.680E+01	3.270E+01
6.730E+01	3.380E+01	6.780E+01	3.870E+01		
18A=1 Collapsing Breaker @ 65.95		Breaker height 4.8 cm			
6.100E+01	1.240E+01	6.200E+01	1.540E+01	6.300E+01	1.880E+01
6.380E+01	2.140E+01	6.420E+01	2.260E+01	6.480E+01	2.320E+01
6.510E+01	2.380E+01	6.550E+01	2.600E+01	6.580E+01	2.900E+01
6.600E+01	3.040E+01	6.620E+01	3.120E+01	6.630E+01	3.180E+01
6.640E+01	3.240E+01	6.650E+01	3.540E+01	6.650E+01	3.470E+01
18A=5 Collapsing Breaker @ 65.95		Breaker height 4.9 cm			
6.100E+01	1.210E+01	6.170E+01	1.240E+01	6.210E+01	1.640E+01
6.280E+01	1.830E+01	6.340E+01	2.020E+01	6.450E+01	2.270E+01
6.500E+01	2.350E+01	6.540E+01	2.520E+01	6.570E+01	2.770E+01
6.590E+01	3.000E+01	6.610E+01	3.100E+01	6.630E+01	3.150E+01
6.640E+01	3.220E+01	6.650E+01	3.500E+01	6.690E+01	3.450E+01
18A=22 Collapsing Breaker @ 65.85		Breaker height 4.6 cm			
6.100E+01	1.180E+01	6.170E+01	1.280E+01	6.190E+01	1.420E+01
6.210E+01	1.660E+01	6.240E+01	1.630E+01	6.320E+01	1.950E+01
6.350E+01	2.000E+01	6.420E+01	2.150E+01	6.460E+01	2.260E+01
6.490E+01	2.300E+01	6.510E+01	2.380E+01	6.540E+01	2.600E+01
6.580E+01	2.900E+01	6.600E+01	3.070E+01	6.620E+01	3.150E+01
6.650E+01	3.220E+01	6.650E+01	3.280E+01	6.660E+01	3.540E+01
6.690E+01	3.430E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
19A-1					
6.100E+01	7.800E+00	6.200E+01	1.470E+01	6.300E+01	1.920E+01
6.400E+01	2.340E+01	6.500E+01	2.730E+01	6.600E+01	2.940E+01
6.700E+01	3.350E+01	6.780E+01	3.820E+01		
19A-1 Collapsing Breaker					
6.100E+01	7.800E+00	6.200E+01	1.450E+01	6.270E+01	1.760E+01
6.310E+01	1.930E+01	6.370E+01	1.940E+01	6.400E+01	2.020E+01
6.440E+01	2.200E+01	6.480E+01	2.540E+01	6.540E+01	2.870E+01
6.570E+01	3.100E+01	6.590E+01	3.140E+01	6.640E+01	3.260E+01
6.650E+01	3.330E+01	6.660E+01	3.530E+01	6.700E+01	3.400E+01
19A-5 Collapsing Breaker @ 65.60		Breaker height 5.6 cm			
6.100E+01	7.600E+00	6.160E+01	1.160E+01	6.210E+01	1.450E+01
6.280E+01	1.800E+01	6.360E+01	1.920E+01	6.410E+01	2.000E+01
6.440E+01	2.220E+01	6.530E+01	2.780E+01	6.660E+01	3.370E+01
6.670E+01	3.540E+01	6.680E+01	3.480E+01	6.680E+01	3.520E+01
6.700E+01	3.410E+01				
19A-29 Collapsing Breaker @ 65.65		Breaker height 5.9 cm			
6.100E+01	7.400E+00	6.120E+01	8.900E+00	6.130E+01	8.500E+00
6.160E+01	1.140E+01	6.200E+01	1.420E+01	6.250E+01	1.660E+01
6.310E+01	1.900E+01	6.360E+01	1.900E+01	6.400E+01	1.970E+01
6.420E+01	2.100E+01	6.450E+01	2.270E+01	6.520E+01	2.740E+01
6.590E+01	3.120E+01	6.640E+01	3.220E+01	6.660E+01	3.350E+01
6.680E+01	3.560E+01	6.700E+01	3.440E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
20A-1					
6.100E+01	9.200E+00	6.200E+01	1.630E+01	6.300E+01	1.940E+01
6.400E+01	2.300E+01	6.500E+01	2.560E+01	6.600E+01	2.980E+01
6.700E+01	3.400E+01	6.750E+01	3.760E+01		
20A-1 Collapsing Breaker					
6.100E+01	9.300E+00	6.180E+01	1.500E+01	6.280E+01	1.780E+01
6.360E+01	1.840E+01	6.400E+01	1.960E+01	6.420E+01	2.100E+01
6.450E+01	2.320E+01	6.510E+01	2.660E+01	6.550E+01	3.020E+01
6.590E+01	3.140E+01	6.620E+01	3.220E+01	6.630E+01	3.310E+01
6.640E+01	3.540E+01	6.680E+01	3.560E+01		
20A-5 Collapsing Breaker @ 65.4		Breaker height 5.4 cm			
6.100E+01	9.600E+00	6.170E+01	1.440E+01	6.230E+01	1.580E+01
6.300E+01	1.780E+01	6.370E+01	1.840E+01	6.400E+01	1.960E+01
6.440E+01	2.220E+01	6.530E+01	2.820E+01	6.580E+01	3.140E+01
6.630E+01	3.240E+01	6.640E+01	3.300E+01	6.650E+01	3.560E+01
6.660E+01	3.500E+01				
20A-29 Collapsing Breaker @ 65.5		Breaker height 5.8 cm			
6.100E+01	9.600E+00	6.160E+01	1.360E+01	6.230E+01	1.600E+01
6.280E+01	1.760E+01	6.320E+01	1.780E+01	6.350E+01	1.770E+01
6.370E+01	1.870E+01	6.420E+01	2.120E+01	6.490E+01	2.570E+01
6.560E+01	3.040E+01	6.580E+01	3.140E+01	6.640E+01	3.250E+01
6.650E+01	3.310E+01	6.670E+01	3.220E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
21A=I Plunging Breaker @ 63.5					
6.000E+01	9.400E+00	6.170E+01	1.620E+01	6.800E+01	4.070E+01
21A=1 Plunging Breaker @ 63.65		Breaker height 9.9 cm			
6.000E+01	7.800E+00	6.010E+01	7.000E+00	6.040E+01	9.200E+00
6.040E+01	8.900E+00	6.070E+01	1.140E+01	6.080E+01	1.040E+01
6.080E+01	1.080E+01	6.090E+01	1.220E+01	6.100E+01	1.130E+01
6.120E+01	1.220E+01	6.140E+01	1.400E+01	6.160E+01	1.340E+01
6.170E+01	1.480E+01	6.180E+01	1.400E+01	6.190E+01	1.500E+01
6.210E+01	1.620E+01	6.220E+01	1.580E+01	6.230E+01	1.770E+01
6.240E+01	1.700E+01	6.260E+01	1.920E+01	6.280E+01	1.870E+01
6.300E+01	2.120E+01	6.310E+01	2.070E+01	6.350E+01	2.450E+01
6.390E+01	2.610E+01	6.420E+01	2.580E+01	6.440E+01	2.540E+01
6.460E+01	2.720E+01	6.490E+01	2.830E+01	6.540E+01	3.050E+01
6.610E+01	3.400E+01	6.700E+01	3.860E+01	6.730E+01	3.800E+01
21A=5 Plunging Breaker @ 64.3		Breaker height 10.4 cm			
5.900E+01	3.300E+00	5.920E+01	2.700E+00	5.930E+01	4.800E+00
5.930E+01	4.200E+00	5.960E+01	5.700E+00	5.980E+01	6.000E+00
5.990E+01	6.000E+00	6.000E+01	7.600E+00	6.010E+01	6.800E+00
6.030E+01	9.300E+00	6.040E+01	8.300E+00	6.070E+01	1.080E+01
6.080E+01	1.000E+01	6.100E+01	1.230E+01	6.110E+01	1.140E+01
6.130E+01	1.370E+01	6.150E+01	1.310E+01	6.170E+01	1.500E+01
6.180E+01	1.400E+01	6.190E+01	1.510E+01	6.190E+01	1.500E+01
6.200E+01	1.630E+01	6.220E+01	1.530E+01	6.230E+01	1.730E+01
6.250E+01	1.630E+01	6.270E+01	1.840E+01	6.280E+01	1.730E+01
6.300E+01	2.000E+01	6.310E+01	1.900E+01	6.330E+01	2.110E+01
6.340E+01	2.100E+01	6.400E+01	2.510E+01	6.430E+01	2.610E+01
6.470E+01	2.540E+01	6.520E+01	2.800E+01	6.590E+01	3.200E+01
6.720E+01	3.880E+01	6.740E+01	3.820E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
22A-1 Plunging Breaker @ 63.4					
6.000E+01	9.400E+00	6.170E+01	1.620E+01	6.800E+01	4.070E+01
22A-1 Plunging Breaker @ 63.7		Breaker height 10.4 cm			
6.000E+01	6.700E+00	6.010E+01	8.400E+00	6.020E+01	8.200E+00
6.040E+01	9.700E+00	6.050E+01	9.200E+00	6.060E+01	1.040E+01
6.070E+01	1.010E+01	6.080E+01	1.140E+01	6.090E+01	1.100E+01
6.110E+01	1.280E+01	6.130E+01	1.240E+01	6.140E+01	1.380E+01
6.150E+01	1.280E+01	6.160E+01	1.380E+01	6.170E+01	1.320E+01
6.180E+01	1.460E+01	6.180E+01	1.380E+01	6.200E+01	1.470E+01
6.200E+01	1.580E+01	6.220E+01	1.520E+01	6.220E+01	1.650E+01
6.240E+01	1.600E+01	6.250E+01	1.740E+01	6.260E+01	1.670E+01
6.270E+01	1.830E+01	6.290E+01	1.770E+01	6.300E+01	1.980E+01
6.370E+01	2.610E+01	6.440E+01	2.720E+01	6.510E+01	2.820E+01
6.590E+01	3.320E+01	6.700E+01	3.940E+01	6.720E+01	3.830E+01
22A-5 Plunging Breaker @ 64.25		Breaker height 10.7 cm			
5.900E+01	3.400E+00	5.920E+01	4.800E+00	5.930E+01	4.500E+00
5.930E+01	6.100E+00	5.940E+01	5.900E+00	5.950E+01	7.600E+00
5.970E+01	7.500E+00	5.980E+01	8.800E+00	5.980E+01	8.700E+00
5.990E+01	1.060E+01	6.010E+01	1.000E+01	6.020E+01	1.100E+01
6.030E+01	1.000E+01	6.050E+01	1.070E+01	6.060E+01	9.500E+00
6.070E+01	1.070E+01	6.080E+01	9.500E+00	6.090E+01	1.050E+01
6.100E+01	1.000E+01	6.110E+01	1.160E+01	6.130E+01	1.070E+01
6.130E+01	1.200E+01	6.140E+01	1.170E+01	6.150E+01	1.330E+01
6.160E+01	1.260E+01	6.170E+01	1.400E+01	6.190E+01	1.300E+01
6.200E+01	1.450E+01	6.210E+01	1.350E+01	6.230E+01	1.500E+01
6.240E+01	1.480E+01	6.240E+01	1.600E+01	6.250E+01	1.670E+01
6.260E+01	1.900E+01	6.270E+01	1.850E+01	6.290E+01	2.100E+01
6.320E+01	2.280E+01	6.330E+01	2.120E+01	6.360E+01	2.400E+01
6.370E+01	2.240E+01	6.400E+01	2.560E+01	6.430E+01	2.690E+01
6.460E+01	2.460E+01	6.480E+01	2.460E+01	6.480E+01	2.560E+01
6.500E+01	2.540E+01	6.510E+01	2.670E+01	6.540E+01	2.800E+01
6.560E+01	2.950E+01	6.620E+01	3.370E+01	6.700E+01	4.000E+01
6.730E+01	3.850E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
23A-1 Surging Breaker @ 63.8					
6.170E+01	1.640E+01	6.800E+01	4.110E+01		
23A-1 Collapsing Breaker @ 63.55		Breaker height 10.2 cm			
6.080E+01	9.200E+00	6.100E+01	9.600E+00	6.120E+01	1.100E+01
6.130E+01	1.100E+01	6.140E+01	1.000E+01	6.160E+01	1.280E+01
6.180E+01	1.350E+01	6.200E+01	1.320E+01	6.220E+01	1.470E+01
6.240E+01	1.680E+01	6.270E+01	2.000E+01	6.290E+01	2.470E+01
6.320E+01	2.720E+01	6.370E+01	2.910E+01	6.420E+01	2.980E+01
6.500E+01	3.120E+01	6.780E+01	4.210E+01	6.790E+01	4.130E+01
23A-5 Collapsing Breaker @ 63.6		Breaker height 9.7 cm			
5.900E+01	1.000E-01	5.920E+01	1.900E+00	5.950E+01	2.200E+00
5.970E+01	3.000E+00	5.980E+01	2.300E+00	6.000E+01	4.000E+00
6.020E+01	5.100E+00	6.030E+01	3.800E+00	6.050E+01	6.000E+00
6.070E+01	5.700E+00	6.090E+01	7.400E+00	6.100E+01	7.200E+00
6.140E+01	9.700E+00	6.160E+01	8.800E+00	6.180E+01	1.100E+01
6.220E+01	1.750E+01	6.250E+01	2.300E+01	6.260E+01	2.420E+01
6.370E+01	2.830E+01	6.510E+01	3.160E+01	6.660E+01	3.720E+01
6.700E+01	3.980E+01	6.730E+01	4.230E+01	6.740E+01	4.300E+01
6.750E+01	4.340E+01	6.770E+01	4.380E+01	6.780E+01	4.230E+01
23A-23 Collapsing Breaker @ 63.5		Breaker height 10.1 cm			
6.000E+01	8.000E-01	6.030E+01	1.200E+00	6.060E+01	2.500E+00
6.070E+01	2.500E+00	6.090E+01	4.500E+00	6.110E+01	5.600E+00
6.120E+01	7.600E+00	6.150E+01	9.400E+00	6.170E+01	1.210E+01
6.190E+01	1.600E+01	6.230E+01	2.370E+01	6.240E+01	2.480E+01
6.350E+01	2.840E+01	6.500E+01	3.210E+01	6.630E+01	3.650E+01
6.690E+01	3.960E+01	6.730E+01	4.300E+01	6.730E+01	4.450E+01
6.750E+01	4.360E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
24A-1 Surging Breaker @ 63.8					
6.170E+01	1.640E+01	6.800E+01	4.110E+01		
24A-1 Surging Breaker @ 63.25		Breaker height 8.7 cm			
6.000E+01	1.200E+00	6.070E+01	3.700E+00	6.130E+01	4.700E+00
6.190E+01	8.400E+00	6.240E+01	1.710E+01	6.280E+01	2.460E+01
6.310E+01	2.560E+01	6.350E+01	2.720E+01	6.420E+01	2.910E+01
6.510E+01	3.150E+01	6.640E+01	3.630E+01	6.680E+01	3.920E+01
6.710E+01	4.200E+01	6.720E+01	4.440E+01	6.730E+01	4.170E+01
6.760E+01	3.980E+01				
24A-5 Collapsing Breaker @ 63.65		Breaker height 9.4 cm			
5.850E+01	2.300E+00	5.920E+01	2.200E+00	5.950E+01	1.400E+00
6.000E+01	1.500E+00	6.070E+01	3.600E+00	6.140E+01	4.200E+00
6.160E+01	5.300E+00	6.180E+01	7.300E+00	6.200E+01	9.700E+00
6.230E+01	1.650E+01	6.260E+01	2.300E+01	6.270E+01	2.440E+01
6.360E+01	2.740E+01	6.480E+01	3.040E+01	6.650E+01	3.640E+01
6.700E+01	3.910E+01	6.720E+01	4.140E+01	6.740E+01	4.320E+01
6.740E+01	4.460E+01	6.760E+01	4.240E+01		
24A-23 Collapsing Breaker @ 63.55		Breaker height 9.2 cm			
5.950E+01	1.200E+00	6.000E+01	1.700E+00	6.070E+01	2.300E+00
6.100E+01	2.400E+00	6.140E+01	3.300E+00	6.160E+01	4.800E+00
6.180E+01	7.400E+00	6.200E+01	1.220E+01	6.240E+01	1.980E+01
6.260E+01	2.400E+01	6.270E+01	2.480E+01	6.390E+01	2.830E+01
6.510E+01	3.160E+01	6.610E+01	3.460E+01	6.670E+01	3.730E+01
6.710E+01	3.980E+01	6.740E+01	4.250E+01	6.750E+01	4.370E+01
6.750E+01	4.540E+01	6.760E+01	4.370E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
25A-1 Collapsing Breaker @ 64.4					
6.100E+01	1.550E+01	6.800E+01	4.070E+01		
25A-1 Collapsing Breaker @ 64.65		Breaker height 6.2 cm			
5.900E+01	2.600E+00	5.950E+01	6.800E+00	6.000E+01	1.200E+01
6.040E+01	1.440E+01	6.070E+01	1.620E+01	6.160E+01	1.820E+01
6.270E+01	2.100E+01	6.300E+01	1.980E+01	6.330E+01	2.100E+01
6.360E+01	1.980E+01	6.370E+01	2.000E+01	6.420E+01	2.840E+01
6.440E+01	2.940E+01	6.560E+01	3.300E+01	6.670E+01	3.850E+01
6.680E+01	3.910E+01	6.680E+01	3.840E+01		
25A-5 Collapsing Breaker @ 64.70		Breaker height 4.9 cm			
5.950E+01	1.500E+00	6.000E+01	7.800E+00	6.050E+01	1.200E+01
6.100E+01	1.390E+01	6.190E+01	1.560E+01	6.260E+01	1.750E+01
6.310E+01	1.600E+01	6.330E+01	1.760E+01	6.350E+01	1.800E+01
6.360E+01	1.690E+01	6.380E+01	1.750E+01	6.420E+01	2.560E+01
6.480E+01	2.690E+01	6.520E+01	2.860E+01	6.570E+01	3.000E+01
6.620E+01	3.260E+01	6.650E+01	3.420E+01	6.680E+01	3.660E+01
6.710E+01	3.690E+01	6.730E+01	3.770E+01		
25A-23 Collapsing Breaker @ 64.65		Breaker height 6.8 cm			
5.900E+01	1.800E+00	5.940E+01	6.600E+00	5.990E+01	1.120E+01
6.040E+01	1.530E+01	6.090E+01	1.660E+01	6.150E+01	1.670E+01
6.200E+01	1.660E+01	6.240E+01	1.670E+01	6.270E+01	1.780E+01
6.320E+01	1.970E+01	6.340E+01	2.120E+01	6.360E+01	2.210E+01
6.380E+01	2.170E+01	6.390E+01	2.250E+01	6.410E+01	2.600E+01
6.420E+01	2.930E+01	6.430E+01	3.020E+01	6.450E+01	3.040E+01
6.560E+01	3.430E+01	6.730E+01	4.120E+01	6.750E+01	4.380E+01
6.760E+01	4.130E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
26A-1 Collapsing Breaker @ 64.4					
6.100E+01	1.550E+01	6.800E+01	4.070E+01		
26A-1 Collapsing Breaker @ 64.85		Breaker height 6.7 cm			
6.000E+01	1.600E+00	6.030E+01	2.800E+00	6.060E+01	7.300E+00
6.100E+01	1.280E+01	6.160E+01	1.620E+01	6.230E+01	1.860E+01
6.310E+01	2.070E+01	6.330E+01	2.100E+01	6.350E+01	2.020E+01
6.390E+01	2.560E+01	6.410E+01	2.850E+01	6.550E+01	3.280E+01
6.650E+01	3.820E+01	6.660E+01	3.880E+01	6.670E+01	3.820E+01
26A-5 Collapsing Breaker @ 64.80		Breaker height 5.1 cm			
6.020E+01	0.	6.050E+01	3.000E-01	6.080E+01	2.200E+00
6.100E+01	7.800E+00	6.150E+01	1.180E+01	6.200E+01	1.350E+01
6.300E+01	1.730E+01	6.330E+01	1.820E+01	6.360E+01	1.700E+01
6.380E+01	1.870E+01	6.410E+01	2.540E+01	6.420E+01	2.510E+01
6.430E+01	2.580E+01	6.470E+01	2.720E+01	6.530E+01	2.900E+01
6.570E+01	3.010E+01	6.630E+01	3.250E+01	6.680E+01	3.520E+01
6.740E+01	3.790E+01				
26A-23 Collapsing Breaker @ 64.85		Breaker height 7.5 cm			
5.900E+01	1.300E+00	5.980E+01	3.400E+00	6.010E+01	2.000E+00
6.030E+01	4.000E+00	6.070E+01	1.000E+01	6.110E+01	1.300E+01
6.180E+01	1.680E+01	6.260E+01	1.930E+01	6.300E+01	1.980E+01
6.320E+01	1.920E+01	6.360E+01	2.160E+01	6.390E+01	2.180E+01
6.440E+01	3.000E+01	6.450E+01	3.070E+01	6.450E+01	3.030E+01
6.590E+01	3.480E+01	6.740E+01	4.130E+01	6.750E+01	4.280E+01
6.760E+01	4.120E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
18-1 Plunging Breaker @ 65.05		Breaker height 5.3 cm			
5.740E+01	4.000E-01	5.930E+01	7.400E+00	6.070E+01	1.300E+01
6.220E+01	1.790E+01	6.460E+01	2.520E+01	6.640E+01	3.180E+01
6.750E+01	3.370E+01				
18-1 Plunging Breaker @ 64.95		Breaker height 4.8 cm			
5.750E+01	3.000E-01	5.850E+01	5.300E+00	5.890E+01	6.100E+00
5.980E+01	1.020E+01	6.100E+01	1.420E+01	6.170E+01	1.610E+01
6.250E+01	1.900E+01	6.330E+01	2.150E+01	6.370E+01	2.250E+01
6.390E+01	2.300E+01	6.400E+01	2.260E+01	6.410E+01	2.340E+01
6.430E+01	2.430E+01	6.430E+01	2.370E+01	6.440E+01	2.450E+01
6.450E+01	2.400E+01	6.450E+01	2.440E+01	6.460E+01	2.360E+01
6.470E+01	2.470E+01	6.480E+01	2.380E+01	6.500E+01	2.520E+01
6.510E+01	2.740E+01	6.560E+01	2.780E+01	6.650E+01	3.320E+01
6.670E+01	3.380E+01	6.690E+01	3.370E+01	6.760E+01	3.580E+01
18-5 Plunging Breaker @ 64.95		Breaker height 5.3 cm			
5.740E+01	7.000E-01	5.870E+01	5.700E+00	5.940E+01	8.000E+00
6.040E+01	1.140E+01	6.100E+01	1.400E+01	6.180E+01	1.630E+01
6.200E+01	1.720E+01	6.200E+01	1.700E+01	6.210E+01	1.760E+01
6.210E+01	1.720E+01	6.220E+01	1.780E+01	6.220E+01	1.750E+01
6.230E+01	1.800E+01	6.230E+01	1.800E+01	6.240E+01	1.880E+01
6.240E+01	1.860E+01	6.250E+01	1.940E+01	6.250E+01	1.930E+01
6.260E+01	2.010E+01	6.270E+01	1.970E+01	6.270E+01	2.060E+01
6.280E+01	2.000E+01	6.290E+01	2.080E+01	6.300E+01	2.010E+01
6.300E+01	2.070E+01	6.310E+01	2.020E+01	6.320E+01	2.080E+01
6.320E+01	2.030E+01	6.330E+01	2.070E+01	6.340E+01	2.110E+01
6.360E+01	2.170E+01	6.360E+01	2.130E+01	6.370E+01	2.220E+01
6.440E+01	2.230E+01	6.460E+01	2.310E+01	6.470E+01	2.440E+01
6.500E+01	2.750E+01	6.530E+01	2.890E+01	6.560E+01	2.900E+01
6.620E+01	3.130E+01	6.660E+01	3.450E+01	6.670E+01	3.470E+01
6.690E+01	3.350E+01	6.780E+01	3.670E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
18-15 Collapsing Breaker @ 64.95		Breaker height 5.8 cm			
5.750E+01	4.000E-01	5.790E+01	2.300E+00	5.820E+01	4.300E+00
5.860E+01	5.300E+00	5.890E+01	6.300E+00	5.940E+01	7.800E+00
5.990E+01	9.300E+00	6.040E+01	1.130E+01	6.050E+01	1.200E+01
6.060E+01	1.250E+01	6.060E+01	1.260E+01	6.070E+01	1.300E+01
6.070E+01	1.300E+01	6.080E+01	1.340E+01	6.080E+01	1.380E+01
6.090E+01	1.370E+01	6.090E+01	1.420E+01	6.100E+01	1.400E+01
6.100E+01	1.440E+01	6.120E+01	1.500E+01	6.140E+01	1.520E+01
6.140E+01	1.550E+01	6.150E+01	1.530E+01	6.150E+01	1.580E+01
6.160E+01	1.640E+01	6.160E+01	1.640E+01	6.170E+01	1.690E+01
6.190E+01	1.720E+01	6.210E+01	1.780E+01	6.220E+01	1.770E+01
6.230E+01	1.840E+01	6.240E+01	1.820E+01	6.240E+01	1.860E+01
6.280E+01	1.910E+01	6.310E+01	2.020E+01	6.340E+01	2.120E+01
6.370E+01	2.170E+01	6.410E+01	2.090E+01	6.420E+01	2.200E+01
6.450E+01	2.430E+01	6.470E+01	2.730E+01	6.510E+01	2.890E+01
6.540E+01	2.880E+01	6.590E+01	2.980E+01	6.620E+01	3.060E+01
6.660E+01	3.190E+01	6.690E+01	3.380E+01	6.720E+01	3.420E+01
6.760E+01	3.600E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
2R-1 Plunging Breaker @ 65.05		Breaker height 5.3 cm			
5.730E+01	9.000E-01	5.910E+01	8.300E+00	6.060E+01	1.380E+01
6.200E+01	1.760E+01	6.350E+01	2.260E+01	6.570E+01	2.880E+01
6.630E+01	3.140E+01	6.760E+01	3.750E+01		
2R-1 Plunging Breaker @ 64.95		Breaker height 5.3 cm			
5.730E+01	3.000E-01	5.830E+01	5.200E+00	5.910E+01	8.000E+00
6.000E+01	1.120E+01	6.070E+01	1.410E+01	6.160E+01	1.720E+01
6.210E+01	1.770E+01	6.270E+01	1.990E+01	6.360E+01	2.270E+01
6.430E+01	2.270E+01	6.460E+01	2.350E+01	6.470E+01	2.400E+01
6.490E+01	2.660E+01	6.530E+01	2.850E+01	6.560E+01	2.800E+01
6.600E+01	3.120E+01	6.670E+01	3.460E+01	6.690E+01	3.380E+01
6.750E+01	3.690E+01				
2R-5 Plunging Breaker @ 64.95		Breaker height 5.4 cm			
5.730E+01	6.000E-01	5.800E+01	4.400E+00	5.870E+01	6.800E+00
5.930E+01	8.600E+00	5.990E+01	1.080E+01	6.060E+01	1.320E+01
6.110E+01	1.550E+01	6.180E+01	1.730E+01	6.240E+01	1.840E+01
6.340E+01	2.230E+01	6.390E+01	2.200E+01	6.440E+01	2.250E+01
6.460E+01	2.340E+01	6.480E+01	2.670E+01	6.530E+01	2.870E+01
6.570E+01	2.780E+01	6.580E+01	2.930E+01	6.590E+01	2.970E+01
6.630E+01	3.260E+01	6.650E+01	3.300E+01	6.660E+01	3.560E+01
6.670E+01	3.480E+01	6.680E+01	3.410E+01		
2R-15 Collapsing Breaker @ 64.95		Breaker height 6 cm			
5.720E+01	1.000E-01	5.770E+01	2.800E+00	5.800E+01	4.400E+00
5.850E+01	5.600E+00	5.900E+01	7.000E+00	5.940E+01	8.900E+00
5.990E+01	1.080E+01	6.040E+01	1.300E+01	6.090E+01	1.480E+01
6.160E+01	1.720E+01	6.210E+01	1.780E+01	6.270E+01	1.960E+01
6.310E+01	2.080E+01	6.360E+01	2.030E+01	6.380E+01	1.910E+01
6.420E+01	2.300E+01	6.440E+01	2.650E+01	6.490E+01	2.850E+01
6.540E+01	2.860E+01	6.620E+01	3.040E+01	6.620E+01	3.020E+01
6.660E+01	3.220E+01	6.700E+01	3.470E+01	6.740E+01	3.600E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
3B-1 Plunging Breaker @ 64.6		Breaker height 6.5 cm			
5.750E+01	1.000E+00	5.890F+01	6.000E+00	5.960E+01	4.900E+00
6.080E+01	1.180E+01	6.190E+01	1.700E+01	6.270E+01	1.930E+01
6.350E+01	2.310E+01	6.440E+01	2.320E+01	6.540E+01	2.970E+01
6.630E+01	3.180E+01	6.770E+01	3.720E+01		
3B-1 Collapsing Breaker @ 65.1		Breaker height 8.3 cm			
5.740E+01	2.000E-01	5.800E+01	1.500E+00	5.830E+01	3.000E+00
5.850E+01	2.400E+00	5.900E+01	4.800F+00	5.980E+01	6.100E+00
6.030E+01	8.700E+00	6.070F+01	1.200F+01	6.100F+01	1.280E+01
6.170E+01	1.670F+01	6.190F+01	1.760E+01	6.240F+01	1.810F+01
6.300F+01	1.980F+01	6.330F+01	2.070F+01	6.350F+01	2.100E+01
6.350E+01	2.090E+01	6.380E+01	2.210E+01	6.400F+01	2.160E+01
6.420E+01	2.300E+01	6.440E+01	2.280E+01	6.460E+01	2.410F+01
6.470E+01	2.670E+01	6.530E+01	2.950F+01	6.610E+01	3.280E+01
6.690F+01	3.750F+01	6.690F+01	3.820F+01	6.730F+01	3.610E+01
3B-5 Collapsing Breaker @ 64.75		Breaker height 7.7 cm			
5.760F+01	1.200F+00	5.770F+01	1.700E+00	5.780E+01	8.000E-01
5.830F+01	2.900F+00	5.850E+01	2.400E+00	5.910F+01	5.300E+00
5.980F+01	6.100E+00	6.000F+01	6.800F+00	6.020E+01	8.700E+00
6.030E+01	9.100F+00	6.030E+01	9.900E+00	6.040E+01	9.800F+00
6.050F+01	1.060F+01	6.050E+01	1.040F+01	6.060E+01	1.170E+01
6.060F+01	1.130F+01	6.070E+01	1.230F+01	6.080E+01	1.200F+01
6.090E+01	1.320E+01	6.100E+01	1.240E+01	6.120E+01	1.410E+01
6.120E+01	1.340E+01	6.150E+01	1.530E+01	6.150F+01	1.520F+01
6.160E+01	1.660E+01	6.170E+01	1.620F+01	6.180F+01	1.710F+01
6.180E+01	1.680F+01	6.200E+01	1.780E+01	6.200E+01	1.740F+01
6.240E+01	1.770E+01	6.270E+01	1.750E+01	6.280E+01	1.820E+01
6.290F+01	1.770E+01	6.300E+01	1.860E+01	6.300E+01	1.790E+01
6.310E+01	1.870E+01	6.320E+01	1.820E+01	6.330E+01	1.950F+01
6.340E+01	1.850F+01	6.350E+01	1.950E+01	6.360E+01	1.890E+01
6.370E+01	1.980E+01	6.380E+01	1.930E+01	6.390E+01	2.020E+01
6.400F+01	1.970E+01	6.420E+01	2.080E+01	6.440F+01	2.330E+01
6.450E+01	2.670F+01	6.580E+01	3.200E+01	6.660E+01	3.690E+01
6.670F+01	3.800F+01	6.700E+01	3.850F+01	6.740E+01	3.670E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
38-24 Collapsing Breaker @ 64.75		Breaker height 8.2 cm			
5.750E+01	1.000E+00	5.770F+01	1.700E+00	5.780F+01	8.000E-01
5.830E+01	2.800E+00	5.840E+01	2.400E+00	5.880E+01	4.200E+00
5.930F+01	5.800E+00	5.960E+01	6.600E+00	5.970E+01	6.200E+00
5.970E+01	7.100E+00	5.980F+01	6.800F+00	5.980E+01	7.400E+00
5.990F+01	6.800E+00	6.000E+01	8.200E+00	6.010E+01	8.000E+00
6.020F+01	9.100F+00	6.020E+01	9.000E+00	6.040E+01	1.000E+01
6.060E+01	1.100E+01	6.080E+01	1.180E+01	6.090E+01	1.140E+01
6.100E+01	1.260E+01	6.100E+01	1.220F+01	6.120E+01	1.390E+01
6.180E+01	1.350F+01	6.150E+01	1.540E+01	6.160E+01	1.630E+01
6.180E+01	1.690E+01	6.180E+01	1.640E+01	6.200E+01	1.760E+01
6.220E+01	1.700F+01	6.250E+01	1.590E+01	6.270E+01	1.660F+01
6.270E+01	1.630E+01	6.290E+01	1.700E+01	6.300E+01	1.650E+01
6.310E+01	1.700E+01	6.310E+01	1.640E+01	6.330E+01	1.790E+01
6.330F+01	1.660E+01	6.350E+01	1.760E+01	6.360E+01	1.700E+01
6.380F+01	1.920E+01	6.410F+01	2.300E+01	6.430E+01	2.660F+01
6.550F+01	3.130E+01	6.680E+01	3.740E+01	6.700E+01	3.860E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
4B-1 Plunging Breaker @ 64.6		Breaker height 7.8 cm			
5.720E+01	6.000E-01	5.810E+01	4.900E+00	5.880E+01	7.200E+00
5.950E+01	6.900E+00	6.080E+01	1.220E+01	6.210E+01	1.850E+01
6.330E+01	2.280E+01	6.420E+01	2.700E+01	6.550E+01	2.980E+01
6.660E+01	3.280E+01	6.760E+01	3.760E+01		
4B-1 Collapsing Breaker @ 65.05		Breaker height 6.2 cm			
5.730E+01	6.000E-01	5.750E+01	1.800E+00	5.760E+01	1.000E+00
5.830E+01	3.000E+00	5.890E+01	6.800E+00	6.000E+01	9.400E+00
6.000E+01	1.020E+01	6.030E+01	1.040E+01	6.100E+01	1.410E+01
6.190E+01	1.640E+01	6.240E+01	1.800E+01	6.300E+01	1.960E+01
6.330E+01	2.100E+01	6.350E+01	2.280E+01	6.430E+01	2.300E+01
6.460E+01	2.160E+01	6.490E+01	2.170E+01	6.510E+01	2.320E+01
6.530E+01	2.730E+01	6.560E+01	3.010E+01	6.620E+01	3.410E+01
6.680E+01	4.030E+01	6.690E+01	4.260E+01	6.750E+01	3.720E+01
4B-5 Collapsing Breaker @ 65.1		Breaker height 7.4 cm			
5.760E+01	1.100E+00	5.820E+01	3.100E+00	5.870E+01	5.600E+00
5.940E+01	8.500E+00	5.990E+01	1.000E+01	6.040E+01	1.080E+01
6.100E+01	1.430E+01	6.170E+01	1.650E+01	6.220E+01	1.730E+01
6.260E+01	1.760E+01	6.300E+01	1.970E+01	6.340E+01	2.170E+01
6.380E+01	2.170E+01	6.400E+01	2.150E+01	6.460E+01	2.030E+01
6.480E+01	2.170E+01	6.510E+01	2.720E+01	6.550E+01	2.980E+01
6.600E+01	3.400E+01	6.650E+01	3.750E+01	6.690E+01	4.190E+01
6.700E+01	4.370E+01	6.730E+01	3.800E+01		
4B-24 Collapsing Breaker @ 65.1		Breaker height 7.3 cm			
5.720E+01	4.000E-01	5.750E+01	2.500E+00	5.760E+01	9.000E-01
5.820E+01	2.500E+00	5.870E+01	5.300E+00	5.940E+01	8.800E+00
5.990E+01	1.020E+01	6.040E+01	1.070E+01	6.090E+01	1.330E+01
6.160E+01	1.620E+01	6.220E+01	1.750E+01	6.290E+01	1.910E+01
6.330E+01	2.080E+01	6.360E+01	2.100E+01	6.410E+01	2.080E+01
6.460E+01	2.000E+01	6.470E+01	2.090E+01	6.510E+01	2.700E+01
6.580E+01	3.250E+01	6.670E+01	3.980E+01	6.700E+01	4.210E+01
6.700E+01	4.330E+01	6.740E+01	3.730E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
SB-1 Plunging Breaker @ 64.0		Breaker height 10 cm			
5.900E+01	1.000E-01	5.980E+01	6.600E+00	6.090E+01	1.230E+01
6.210E+01	1.770E+01	6.380E+01	2.350E+01	6.500E+01	2.880E+01
6.750E+01	3.680E+01				
SB-1 Plunging Breaker @ 64.15		Breaker height 10.5 cm			
5.900E+01	5.000E-01	5.910E+01	1.700E+00	5.920E+01	1.100E+00
5.930E+01	2.600E+00	5.950E+01	2.200E+00	5.980E+01	5.200E+00
5.990E+01	4.300E+00	6.010E+01	7.600E+00	6.030E+01	9.000E+00
6.060E+01	1.040E+01	6.070E+01	1.030E+01	6.080E+01	1.140E+01
6.090E+01	1.160E+01	6.120E+01	1.350E+01	6.130E+01	1.290E+01
6.140E+01	1.420E+01	6.160E+01	1.380E+01	6.180E+01	1.580E+01
6.210E+01	1.680E+01	6.240E+01	1.780E+01	6.260E+01	1.830E+01
6.280E+01	1.970E+01	6.310E+01	2.020E+01	6.340E+01	2.010E+01
6.350E+01	2.100E+01	6.370E+01	2.390E+01	6.410E+01	2.540E+01
6.460E+01	2.570E+01	6.480E+01	2.740E+01	6.530E+01	3.120E+01
6.570E+01	3.360E+01	6.620E+01	3.500E+01	6.700E+01	3.750E+01
6.760E+01	3.730E+01				
SB-5 Spilling Breaker @ 62.6		Breaker height 10 cm			
5.910E+01	8.000E-01	5.920E+01	2.300E+00	5.930E+01	1.500E+00
5.940E+01	2.800E+00	5.940E+01	2.500E+00	5.950E+01	3.500E+00
5.960E+01	3.300E+00	5.970E+01	4.800E+00	5.980E+01	5.100E+00
5.990E+01	5.800E+00	5.990E+01	6.200E+00	6.000E+01	6.900E+00
6.010E+01	6.400E+00	6.030E+01	9.000E+00	6.040E+01	8.900E+00
6.050E+01	1.060E+01	6.060E+01	1.010E+01	6.080E+01	1.200E+01
6.090E+01	1.150E+01	6.110E+01	1.380E+01	6.120E+01	1.250E+01
6.140E+01	1.500E+01	6.150E+01	1.320E+01	6.200E+01	1.950E+01
6.230E+01	2.330E+01	6.270E+01	2.480E+01	6.320E+01	2.490E+01
6.370E+01	2.360E+01	6.410E+01	2.370E+01	6.480E+01	2.580E+01
6.490E+01	2.770E+01	6.520E+01	2.800E+01	6.560E+01	2.580E+01
6.580E+01	2.860E+01	6.650E+01	3.280E+01	6.740E+01	3.900E+01
6.780E+01	3.760E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)

5R-24 Collapsing Breaker @ 61.95 and 65.35 Breaker height 9.8 cm

5.880E+01	8.000E-01	5.890E+01	3.000E-01	5.900E+01	1.500E+00
5.900E+01	1.000E+00	5.910E+01	2.400E+00	5.920E+01	2.000E+00
5.930E+01	3.300E+00	5.930E+01	2.700E+00	5.950E+01	4.800E+00
5.980E+01	5.700E+00	5.990E+01	7.200E+00	6.020E+01	8.400E+00
6.020E+01	7.200E+00	6.040E+01	8.200E+00	6.080E+01	1.290E+01
6.100E+01	1.480E+01	6.120E+01	1.580E+01	6.130E+01	1.720E+01
6.140E+01	1.810E+01	6.170E+01	2.280E+01	6.210E+01	2.430E+01
6.260E+01	2.520E+01	6.290E+01	2.280E+01	6.340E+01	2.020E+01
6.350E+01	2.070E+01	6.360E+01	1.940E+01	6.370E+01	2.040E+01
6.380E+01	1.980E+01	6.390E+01	2.080E+01	6.410E+01	2.120E+01
6.410E+01	2.080E+01	6.420E+01	2.150E+01	6.430E+01	2.130E+01
6.450E+01	2.230E+01	6.460E+01	2.230E+01	6.470E+01	2.380E+01
6.480E+01	2.360E+01	6.500E+01	2.520E+01	6.510E+01	2.760E+01
6.550E+01	2.900E+01	6.570E+01	2.820E+01	6.600E+01	2.590E+01
6.620E+01	2.980E+01	6.700E+01	3.370E+01	6.780E+01	3.970E+01
6.800E+01	3.880E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
6R-1 Plunging Breaker @ 63.9		Breaker height 10.1 cm			
5.800E+01	1.800E+00	5.900E+01	6.200E+00	6.040E+01	1.040E+01
6.090E+01	1.360E+01	6.240E+01	1.740E+01	6.380E+01	2.440E+01
6.520E+01	2.980E+01	6.730E+01	3.720E+01		
6R-1 Plunging Breaker @ 63.9		Breaker height 9.7 cm			
5.780E+01	1.600E+00	5.830E+01	2.700E+00	5.850E+01	3.000E+00
5.870E+01	4.500E+00	5.880E+01	5.800E+00	5.890E+01	5.300E+00
5.910E+01	6.400E+00	5.920E+01	5.300E+00	5.930E+01	7.800E+00
5.940E+01	8.000E+00	5.960E+01	9.700E+00	5.960E+01	8.400E+00
5.980E+01	1.020E+01	5.990E+01	8.100E+00	6.010E+01	9.500E+00
6.020E+01	8.800E+00	6.040E+01	1.080E+01	6.060E+01	1.000E+01
6.080E+01	1.290E+01	6.110E+01	1.370E+01	6.150E+01	1.360E+01
6.170E+01	1.200E+01	6.180E+01	1.330E+01	6.190E+01	1.260E+01
6.200E+01	1.480E+01	6.220E+01	1.510E+01	6.230E+01	1.750E+01
6.250E+01	1.670E+01	6.270E+01	1.930E+01	6.290E+01	1.730E+01
6.310E+01	2.020E+01	6.330E+01	1.860E+01	6.350E+01	2.270E+01
6.370E+01	2.180E+01	6.390E+01	2.340E+01	6.430E+01	2.590E+01
6.460E+01	2.420E+01	6.480E+01	2.420E+01	6.500E+01	2.780E+01
6.510E+01	2.830E+01	6.580E+01	3.280E+01	6.660E+01	4.030E+01
6.750E+01	3.730E+01				
6R-5 Plunging Breaker @ 64.15		Breaker height 10.8 cm			
5.790E+01	1.800E+00	5.800E+01	1.800E+00	5.810E+01	3.500E+00
5.820E+01	3.300E+00	5.830E+01	5.300E+00	5.850E+01	4.900E+00
5.860E+01	6.700E+00	5.870E+01	6.300E+00	5.880E+01	6.700E+00
5.890E+01	8.700E+00	5.900E+01	8.200E+00	5.920E+01	8.700E+00
5.930E+01	7.000E+00	5.940E+01	8.300E+00	5.950E+01	6.200E+00
5.970E+01	7.100E+00	5.980E+01	8.800E+00	5.990E+01	7.000E+00
6.000E+01	5.800E+00	6.010E+01	7.200E+00	6.020E+01	6.000E+00
6.030E+01	7.000E+00	6.040E+01	6.000E+00	6.050E+01	7.000E+00
6.050E+01	6.800E+00	6.060E+01	8.400E+00	6.070E+01	8.600E+00
6.080E+01	1.150E+01	6.100E+01	1.280E+01	6.150E+01	1.080E+01
6.160E+01	9.800E+00	6.190E+01	1.460E+01	6.220E+01	1.470E+01
6.230E+01	1.770E+01	6.250E+01	1.660E+01	6.280E+01	1.990E+01
6.290E+01	1.750E+01	6.330E+01	2.120E+01	6.340E+01	2.000E+01
6.370E+01	2.460E+01	6.400E+01	2.650E+01	6.430E+01	2.600E+01
6.480E+01	2.410E+01	6.500E+01	2.740E+01	6.570E+01	3.220E+01
6.660E+01	4.000E+01	6.680E+01	4.250E+01	6.750E+01	3.770E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
68-24 Plunging Breaker @ 64.1		Breaker height 11.1 cm			
5.760E+01	4.000E-01	5.800E+01	4.400E+00	5.820E+01	4.400E+00
5.830E+01	6.600E+00	5.840E+01	6.200E+00	5.850E+01	7.000E+00
5.860E+01	6.000E+00	5.870E+01	8.300E+00	5.890E+01	8.200E+00
5.900E+01	9.800E+00	5.920E+01	8.200E+00	5.940E+01	8.100E+00
5.950E+01	6.500E+00	5.970E+01	7.900E+00	5.980E+01	5.700E+00
5.990E+01	7.000E+00	6.010E+01	5.300E+00	6.020E+01	6.300E+00
6.030E+01	5.400E+00	6.040E+01	6.000E+00	6.050E+01	5.100E+00
6.060E+01	6.300E+00	6.060E+01	5.900E+00	6.070E+01	7.200E+00
6.080E+01	6.600E+00	6.090E+01	7.500E+00	6.090E+01	6.800E+00
6.100E+01	7.600E+00	6.110E+01	7.000E+00	6.130E+01	8.200E+00
6.140E+01	8.000E+00	6.140E+01	9.200E+00	6.150E+01	9.000E+00
6.160E+01	1.050E+01	6.170E+01	1.030E+01	6.180E+01	1.220E+01
6.190E+01	1.260E+01	6.200E+01	1.550E+01	6.230E+01	1.590E+01
6.240E+01	1.880E+01	6.260E+01	1.780E+01	6.300E+01	2.160E+01
6.310E+01	1.910E+01	6.350E+01	2.320E+01	6.360E+01	2.320E+01
6.370E+01	2.500E+01	6.400E+01	2.680E+01	6.430E+01	2.660E+01
6.480E+01	2.420E+01	6.510E+01	2.830E+01	6.580E+01	3.340E+01
6.670E+01	4.160E+01	6.680E+01	4.330E+01	6.750E+01	3.770E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
7B-T Plunging Breaker @ 63.15		Breaker height 8.6 cm			
5.950E+01	6.000E-01	5.990E+01	2.900E+00	6.050E+01	7.900E+00
6.090E+01	1.250E+01	6.150E+01	1.630E+01	6.240E+01	2.050E+01
6.390E+01	2.370E+01	6.510E+01	2.840E+01	6.750E+01	3.660E+01
7B-1 Plunging Breaker @ 62.5		Breaker height 9 cm			
5.940E+01	3.000E-01	5.940E+01	7.000E-01	5.950E+01	5.000E-01
5.950E+01	1.400E+00	5.960E+01	1.300E+00	5.960E+01	1.600E+00
5.970E+01	1.100E+00	5.970E+01	1.400E+00	5.980E+01	2.100E+00
5.990E+01	2.900E+00	6.030E+01	7.000E+00	6.080E+01	1.130E+01
6.120E+01	1.430E+01	6.170E+01	1.850E+01	6.200E+01	2.250E+01
6.220E+01	2.420E+01	6.240E+01	2.450E+01	6.260E+01	2.360E+01
6.280E+01	2.040E+01	6.300E+01	1.950E+01	6.320E+01	2.210E+01
6.330E+01	2.230E+01	6.340E+01	2.360E+01	6.370E+01	2.250E+01
6.410E+01	2.390E+01	6.420E+01	2.460E+01	6.430E+01	2.520E+01
6.440E+01	2.520E+01	6.440E+01	2.560E+01	6.450E+01	2.590E+01
6.470E+01	2.600E+01	6.480E+01	2.730E+01	6.500E+01	2.780E+01
6.530E+01	2.720E+01	6.560E+01	2.890E+01	6.590E+01	2.950E+01
6.630E+01	3.150E+01	6.670E+01	3.420E+01	6.750E+01	3.670E+01
7B-5 Plunging Breaker @ 62.15		Breaker height 9.2 cm			
5.940E+01	5.000E-01	5.990E+01	3.100E+00	6.030E+01	7.800E+00
6.090E+01	1.400E+01	6.120E+01	1.610E+01	6.160E+01	1.900E+01
6.180E+01	2.260E+01	6.210E+01	2.450E+01	6.230E+01	2.470E+01
6.240E+01	2.310E+01	6.260E+01	2.000E+01	6.290E+01	2.010E+01
6.310E+01	2.130E+01	6.330E+01	2.100E+01	6.340E+01	2.220E+01
6.380E+01	2.310E+01	6.410E+01	2.330E+01	6.450E+01	2.480E+01
6.490E+01	2.660E+01	6.540E+01	2.850E+01	6.600E+01	2.960E+01
6.640E+01	3.020E+01	6.680E+01	3.220E+01	6.710E+01	3.350E+01
6.720E+01	3.530E+01	6.780E+01	3.750E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
7B-22 Plunging Breaker @ 62.15		Breaker height 8.5 cm			
5.860E+01	2.000E-01	5.860E+01	1.000E+00	5.870E+01	1.300E+00
5.870E+01	1.000E+00	5.880E+01	1.800E+00	5.880E+01	2.400E+00
5.900E+01	2.800E+00	5.900E+01	3.600E+00	5.910E+01	4.100E+00
5.920E+01	4.600E+00	5.920E+01	4.400E+00	5.930E+01	5.700E+00
5.940E+01	6.400E+00	5.940E+01	6.100E+00	5.950E+01	7.000E+00
5.950E+01	6.700E+00	5.960E+01	7.600E+00	5.970E+01	7.400E+00
5.970E+01	8.200E+00	5.980E+01	7.800E+00	5.980E+01	8.500E+00
5.990E+01	8.100E+00	6.000E+01	8.900E+00	6.000E+01	8.500E+00
6.010E+01	9.400E+00	6.010E+01	9.100E+00	6.020E+01	9.900E+00
6.030E+01	1.040E+01	6.050E+01	1.180E+01	6.060E+01	1.250E+01
6.060E+01	1.220E+01	6.070E+01	1.320E+01	6.080E+01	1.380E+01
6.090E+01	1.380E+01	6.090E+01	1.460E+01	6.100E+01	1.420E+01
6.110E+01	1.510E+01	6.110E+01	1.510E+01	6.120E+01	1.590E+01
6.130E+01	1.560E+01	6.130E+01	1.650E+01	6.140E+01	1.600E+01
6.150E+01	1.700E+01	6.150E+01	1.660E+01	6.170E+01	1.780E+01
6.180E+01	1.700E+01	6.190E+01	1.920E+01	6.210E+01	2.070E+01
6.230E+01	2.140E+01	6.250E+01	2.380E+01	6.280E+01	2.530E+01
6.300E+01	2.480E+01	6.340E+01	2.070E+01	6.390E+01	2.280E+01
6.420E+01	2.350E+01	6.460E+01	2.380E+01	6.520E+01	2.570E+01
6.550E+01	2.750E+01	6.590E+01	2.850E+01	6.640E+01	2.900E+01
6.690E+01	3.020E+01	6.780E+01	3.440E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
BB-1 Plunging Breaker @ 63.2		Breaker height 8.7 cm			
5.800E+01	1.000E+00	5.840E+01	2.300E+00	5.940E+01	7.000E+00
6.020E+01	8.700E+00	6.140E+01	1.470E+01	6.250E+01	1.910E+01
6.350E+01	2.400E+01	6.510E+01	2.890E+01	6.770E+01	3.830E+01
BB-1 Plunging Breaker @ 62.65		Breaker height 9 cm			
5.770E+01	7.000E-01	5.820E+01	1.300E+00	5.880E+01	5.300E+00
5.940E+01	6.300E+00	5.940E+01	7.400E+00	5.960E+01	7.000E+00
5.970E+01	8.700E+00	5.980E+01	8.000E+00	5.990E+01	8.700E+00
5.990E+01	8.800E+00	6.000E+01	9.400E+00	6.010E+01	8.500E+00
6.020E+01	9.700E+00	6.030E+01	9.100E+00	6.040E+01	1.030E+01
6.050E+01	9.400E+00	6.060E+01	1.050E+01	6.070E+01	1.010E+01
6.080E+01	1.150E+01	6.090E+01	1.200E+01	6.090E+01	1.160E+01
6.100E+01	1.340E+01	6.130E+01	1.610E+01	6.150E+01	1.820E+01
6.180E+01	1.910E+01	6.210E+01	1.990E+01	6.230E+01	2.290E+01
6.260E+01	2.430E+01	6.300E+01	2.170E+01	6.330E+01	1.910E+01
6.370E+01	2.300E+01	6.390E+01	2.400E+01	6.430E+01	2.400E+01
6.470E+01	2.570E+01	6.500E+01	2.730E+01	6.540E+01	2.830E+01
6.570E+01	2.900E+01	6.640E+01	3.500E+01	6.660E+01	3.440E+01
BB-5 Plunging Breaker @ 62.7		Breaker height 9.1 cm			
5.770E+01	6.000E-01	5.820E+01	1.700E+00	5.870E+01	4.300E+00
5.910E+01	5.600E+00	5.920E+01	6.800E+00	5.930E+01	7.300E+00
5.940E+01	7.200E+00	5.940E+01	7.800E+00	5.950E+01	7.600E+00
5.960E+01	8.800E+00	5.960E+01	8.300E+00	5.970E+01	9.700E+00
5.980E+01	9.000E+00	5.990E+01	1.090E+01	6.010E+01	1.140E+01
6.020E+01	1.050E+01	6.030E+01	1.170E+01	6.040E+01	1.130E+01
6.040E+01	1.250E+01	6.050E+01	1.200E+01	6.060E+01	1.300E+01
6.070E+01	1.250E+01	6.080E+01	1.330E+01	6.080E+01	1.230E+01
6.100E+01	1.470E+01	6.130E+01	1.680E+01	6.160E+01	1.790E+01
6.160E+01	1.720E+01	6.180E+01	1.990E+01	6.200E+01	2.070E+01
6.210E+01	1.930E+01	6.230E+01	2.180E+01	6.240E+01	2.060E+01
6.250E+01	2.130E+01	6.270E+01	2.440E+01	6.290E+01	2.540E+01
6.320E+01	2.380E+01	6.340E+01	2.000E+01	6.370E+01	1.980E+01
6.390E+01	2.140E+01	6.440E+01	2.240E+01	6.490E+01	2.520E+01
6.500E+01	2.700E+01	6.560E+01	2.830E+01	6.620E+01	3.150E+01
6.680E+01	3.570E+01	6.760E+01	3.770E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
BB-23 Plunging Breaker @ 62.7		Breaker height 9.3 cm			
5.790E+01	1.000E+00	5.850E+01	4.500E+00	5.890E+01	7.300E+00
5.930E+01	8.800E+00	5.970E+01	1.000E+01	6.000E+01	1.180E+01
6.010E+01	1.090E+01	6.020E+01	1.250E+01	6.050E+01	1.360E+01
6.050E+01	1.290E+01	6.070E+01	1.350E+01	6.070E+01	1.280E+01
6.090E+01	1.390E+01	6.090E+01	1.310E+01	6.110E+01	1.470E+01
6.110E+01	1.400E+01	6.130E+01	1.580E+01	6.140E+01	1.530E+01
6.150E+01	1.580E+01	6.160E+01	1.480E+01	6.170E+01	1.710E+01
6.190E+01	1.860E+01	6.200E+01	1.770E+01	6.230E+01	2.300E+01
6.260E+01	2.510E+01	6.290E+01	2.520E+01	6.330E+01	2.010E+01
6.350E+01	1.990E+01	6.380E+01	2.160E+01	6.400E+01	2.340E+01
6.420E+01	2.450E+01	6.450E+01	2.400E+01	6.480E+01	2.490E+01
6.520E+01	2.550E+01	6.560E+01	2.720E+01	6.580E+01	2.850E+01
6.600E+01	2.910E+01	6.620E+01	2.880E+01	6.630E+01	2.950E+01
6.670E+01	3.270E+01	6.710E+01	3.630E+01	6.750E+01	3.760E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
9R=1 Plunging Breaker @ 63.25		Breaker height 8.5 cm			
5.880E+01	5.000E-01	6.000E+01	1.140E+01	6.040E+01	1.400E+01
6.140E+01	1.620E+01	6.260E+01	2.050E+01	6.400E+01	2.520E+01
6.500E+01	2.850E+01	6.600E+01	3.150E+01	6.800E+01	3.780E+01
9R=1 Plunging Breaker @ 63.8		Breaker height 9.3 cm			
5.870E+01	5.000E-01	5.880E+01	1.000E+00	5.890E+01	2.000E+00
5.900E+01	2.500E+00	5.900E+01	3.400E+00	5.910E+01	3.300E+00
5.910E+01	4.400E+00	5.920E+01	4.200E+00	5.920E+01	5.200E+00
5.930E+01	5.100E+00	5.940E+01	6.400E+00	5.940E+01	6.300E+00
5.960E+01	7.700E+00	5.970E+01	7.600E+00	5.970E+01	8.800E+00
5.980E+01	8.800E+00	5.990E+01	9.800E+00	6.000E+01	9.600E+00
6.010E+01	1.060E+01	6.020E+01	1.020E+01	6.020E+01	1.120E+01
6.030E+01	1.070E+01	6.050E+01	1.210E+01	6.060E+01	1.200E+01
6.060E+01	1.310E+01	6.070E+01	1.260E+01	6.080E+01	1.390E+01
6.090E+01	1.350E+01	6.100E+01	1.490E+01	6.110E+01	1.450E+01
6.120E+01	1.570E+01	6.130E+01	1.530E+01	6.140E+01	1.610E+01
6.150E+01	1.530E+01	6.170E+01	1.620E+01	6.180E+01	1.700E+01
6.190E+01	1.670E+01	6.200E+01	1.770E+01	6.210E+01	1.740E+01
6.220E+01	1.870E+01	6.230E+01	1.790E+01	6.240E+01	1.940E+01
6.250E+01	1.880E+01	6.260E+01	2.000E+01	6.270E+01	1.940E+01
6.290E+01	2.080E+01	6.290E+01	1.950E+01	6.320E+01	2.170E+01
6.330E+01	2.110E+01	6.350E+01	2.340E+01	6.390E+01	2.620E+01
6.420E+01	2.580E+01	6.450E+01	2.420E+01	6.510E+01	2.780E+01
6.570E+01	3.230E+01	6.620E+01	3.320E+01	6.680E+01	3.530E+01
6.720E+01	3.480E+01	6.750E+01	3.570E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
98-5 Plunging Breaker @ 64.0		Breaker height 9.4 cm			
5.870E+01	1.000E+00	5.870E+01	2.000E+00	5.880E+01	1.700E+00
5.890E+01	2.700E+00	5.890E+01	2.500E+00	5.900E+01	3.500E+00
5.900E+01	3.300E+00	5.910E+01	4.400E+00	5.910E+01	4.100E+00
5.920E+01	5.200E+00	5.930E+01	5.900E+00	5.940E+01	6.800E+00
5.940E+01	6.700E+00	5.950E+01	7.700E+00	5.960E+01	7.500E+00
5.960E+01	8.400E+00	5.970E+01	8.000E+00	5.980E+01	9.300E+00
5.990E+01	8.600E+00	6.000E+01	9.700E+00	6.000E+01	9.500E+00
6.010E+01	1.070E+01	6.030E+01	1.130E+01	6.040E+01	1.270E+01
6.050E+01	1.260E+01	6.050E+01	1.350E+01	6.060E+01	1.280E+01
6.080E+01	1.370E+01	6.080E+01	1.300E+01	6.100E+01	1.400E+01
6.110E+01	1.330E+01	6.120E+01	1.520E+01	6.130E+01	1.430E+01
6.140E+01	1.520E+01	6.170E+01	1.520E+01	6.180E+01	1.600E+01
6.210E+01	1.520E+01	6.210E+01	1.570E+01	6.220E+01	1.500E+01
6.230E+01	1.630E+01	6.230E+01	1.620E+01	6.240E+01	1.750E+01
6.250E+01	1.720E+01	6.260E+01	1.880E+01	6.270E+01	1.820E+01
6.280E+01	1.960E+01	6.300E+01	1.860E+01	6.310E+01	2.000E+01
6.350E+01	1.880E+01	6.360E+01	2.060E+01	6.360E+01	1.970E+01
6.370E+01	2.340E+01	6.380E+01	2.400E+01	6.400E+01	2.570E+01
6.430E+01	2.680E+01	6.470E+01	2.600E+01	6.500E+01	2.820E+01
6.550E+01	3.200E+01	6.580E+01	3.410E+01	6.610E+01	3.460E+01
6.630E+01	3.470E+01	6.660E+01	3.660E+01	6.730E+01	3.560E+01
98-24 Collapsing Breaker @ 62.15 and 65.1		Breaker height 9.2 cm			
5.850E+01	9.000E-01	5.850E+01	1.800E+00	5.860E+01	1.100E+00
5.860E+01	1.800E+00	5.870E+01	1.300E+00	5.880E+01	2.300E+00
5.880E+01	1.900E+00	5.890E+01	2.700E+00	5.890E+01	2.200E+00
5.900E+01	3.300E+00	5.900E+01	2.900E+00	5.910E+01	3.800E+00
5.920E+01	3.800E+00	5.920E+01	5.300E+00	5.930E+01	6.300E+00
5.980E+01	7.500E+00	6.020E+01	9.200E+00	6.050E+01	1.080E+01
6.070E+01	1.140E+01	6.100E+01	1.110E+01	6.130E+01	1.390E+01
6.150E+01	1.600E+01	6.180E+01	1.890E+01	6.200E+01	2.230E+01
6.220E+01	2.390E+01	6.260E+01	2.550E+01	6.280E+01	2.490E+01
6.310E+01	2.240E+01	6.320E+01	2.180E+01	6.340E+01	2.210E+01
6.360E+01	2.180E+01	6.380E+01	2.160E+01	6.390E+01	2.230E+01
6.430E+01	2.270E+01	6.460E+01	2.360E+01	6.500E+01	2.530E+01
6.510E+01	2.780E+01	6.560E+01	2.880E+01	6.570E+01	2.820E+01
6.590E+01	2.960E+01	6.610E+01	3.060E+01	6.670E+01	3.380E+01
6.710E+01	3.680E+01	6.720E+01	3.790E+01	6.750E+01	3.550E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
10R-T Plunging Breaker @ 63.25		Breaker height 8.4 cm			
5.760E+01	8.000E-01	5.850E+01	4.000E+00	5.940E+01	8.800E+00
6.000E+01	1.170E+01	6.130E+01	1.580E+01	6.320E+01	2.170E+01
6.460E+01	2.570E+01	6.700E+01	3.230E+01	6.800E+01	3.730E+01
10R-1 Plunging Breaker @ 63.85		Breaker height 8.2 cm			
5.800E+01	1.600E+00	5.880E+01	5.700E+00	5.930E+01	8.500E+00
5.940E+01	9.200E+00	5.940E+01	9.000E+00	5.960E+01	1.010E+01
5.970E+01	9.500E+00	5.980E+01	1.060E+01	5.990E+01	1.010E+01
6.010E+01	1.140E+01	6.030E+01	1.110E+01	6.050E+01	1.210E+01
6.070E+01	1.280E+01	6.080E+01	1.220E+01	6.100E+01	1.420E+01
6.110E+01	1.420E+01	6.120E+01	1.530E+01	6.130E+01	1.410E+01
6.150E+01	1.550E+01	6.150E+01	1.420E+01	6.170E+01	1.580E+01
6.180E+01	1.440E+01	6.200E+01	1.580E+01	6.210E+01	1.520E+01
6.270E+01	1.800E+01	6.310E+01	1.920E+01	6.330E+01	1.920E+01
6.340E+01	2.080E+01	6.350E+01	1.970E+01	6.370E+01	2.170E+01
6.380E+01	1.990E+01	6.410E+01	2.450E+01	6.420E+01	2.510E+01
6.430E+01	2.650E+01	6.460E+01	2.730E+01	6.510E+01	2.660E+01
6.520E+01	2.790E+01	6.580E+01	3.180E+01	6.610E+01	3.420E+01
6.650E+01	3.630E+01	6.660E+01	3.560E+01	6.710E+01	3.630E+01
6.760E+01	3.510E+01	6.800E+01	3.760E+01		
10R-5 Plunging Breaker @ 64.1		Breaker height 9.3 cm			
5.780E+01	1.300E+00	5.820E+01	2.500E+00	5.840E+01	4.700E+00
5.860E+01	5.200E+00	5.870E+01	6.100E+00	5.880E+01	5.900E+00
5.890E+01	7.000E+00	5.910E+01	7.500E+00	5.920E+01	8.300E+00
5.930E+01	8.200E+00	5.940E+01	8.700E+00	5.940E+01	8.200E+00
5.950E+01	8.700E+00	5.960E+01	8.100E+00	5.970E+01	9.200E+00
5.970E+01	8.500E+00	5.990E+01	9.600E+00	6.010E+01	9.600E+00
6.020E+01	9.200E+00	6.050E+01	1.020E+01	6.060E+01	1.100E+01
6.070E+01	1.110E+01	6.080E+01	1.240E+01	6.080E+01	1.200E+01
6.100E+01	1.350E+01	6.110E+01	1.220E+01	6.130E+01	1.420E+01
6.140E+01	1.280E+01	6.160E+01	1.400E+01	6.170E+01	1.290E+01
6.200E+01	1.420E+01	6.200E+01	1.340E+01	6.210E+01	1.160E+01
6.220E+01	1.380E+01	6.230E+01	1.550E+01	6.250E+01	1.620E+01
6.260E+01	1.530E+01	6.270E+01	1.820E+01	6.280E+01	1.830E+01
6.300E+01	2.030E+01	6.310E+01	1.950E+01	6.330E+01	2.150E+01
6.350E+01	1.980E+01	6.360E+01	2.200E+01	6.380E+01	2.110E+01
6.400E+01	2.530E+01	6.450E+01	2.660E+01	6.480E+01	2.590E+01
6.550E+01	3.050E+01	6.590E+01	3.380E+01	6.640E+01	3.700E+01
6.650E+01	3.880E+01	6.750E+01	3.540E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
10B-24 Plunging Breaker @ 63.2		Breaker height 9.1 cm			
5.790E+01	1.600E+00	5.820E+01	4.000E+00	5.840E+01	4.000E+00
5.870E+01	6.000E+00	5.910E+01	7.500E+00	5.920E+01	9.000E+00
5.930E+01	8.100E+00	5.950E+01	8.300E+00	5.960E+01	6.900E+00
5.970E+01	7.100E+00	5.980E+01	6.100E+00	5.990E+01	7.400E+00
6.000E+01	7.100E+00	6.000E+01	7.600E+00	6.010E+01	6.900E+00
6.020E+01	8.300E+00	6.030E+01	8.100E+00	6.040E+01	8.800E+00
6.040E+01	8.300E+00	6.050E+01	9.500E+00	6.060E+01	9.100E+00
6.060E+01	9.800E+00	6.070E+01	9.100E+00	6.080E+01	1.040E+01
6.080E+01	9.800E+00	6.130E+01	1.340E+01	6.150E+01	1.660E+01
6.170E+01	1.670E+01	6.190E+01	1.830E+01	6.200E+01	1.680E+01
6.220E+01	1.900E+01	6.240E+01	1.690E+01	6.260E+01	1.840E+01
6.270E+01	1.700E+01	6.280E+01	1.920E+01	6.290E+01	2.110E+01
6.320E+01	2.480E+01	6.350E+01	2.610E+01	6.390E+01	2.640E+01
6.420E+01	2.520E+01	6.440E+01	2.620E+01	6.500E+01	2.430E+01
6.520E+01	2.320E+01	6.540E+01	2.510E+01	6.540E+01	2.510E+01
6.560E+01	2.820E+01	6.580E+01	2.990E+01	6.610E+01	3.210E+01
6.650E+01	3.560E+01	6.680E+01	3.990E+01	6.750E+01	3.560E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
11R-1 Plunging Breaker @ 63.5		Breaker height 9 cm			
5.860E+01	1.600E+00	5.950E+01	1.090E+01	6.180E+01	1.830E+01
6.450E+01	2.680E+01	6.600E+01	3.180E+01	6.780E+01	3.730E+01
6.800E+01	3.800E+01				
11R-1 Collapsing Breaker @ 63.7		Breaker height 9.6 cm			
5.860E+01	7.000E-01	5.910E+01	6.200E+00	5.970E+01	1.040E+01
6.020E+01	1.230E+01	6.060E+01	1.310E+01	6.100E+01	1.350E+01
6.140E+01	1.270E+01	6.200E+01	1.340E+01	6.240E+01	1.500E+01
6.310E+01	1.880E+01	6.340E+01	2.340E+01	6.370E+01	2.530E+01
6.400E+01	2.570E+01	6.420E+01	2.500E+01	6.450E+01	2.390E+01
6.470E+01	2.740E+01	6.500E+01	2.870E+01	6.580E+01	3.320E+01
6.650E+01	3.800E+01	6.690E+01	3.760E+01	6.800E+01	3.650E+01
11R-5 Plunging Breaker @ 63.6		Breaker height 9.3 cm			
5.840E+01	2.000E-01	5.900E+01	5.400E+00	5.960E+01	9.600E+00
6.000E+01	1.130E+01	6.080E+01	1.290E+01	6.120E+01	1.220E+01
6.160E+01	1.040E+01	6.180E+01	1.150E+01	6.200E+01	1.340E+01
6.210E+01	1.370E+01	6.220E+01	1.630E+01	6.240E+01	1.680E+01
6.260E+01	1.920E+01	6.280E+01	1.810E+01	6.310E+01	2.150E+01
6.320E+01	2.030E+01	6.350E+01	2.380E+01	6.370E+01	2.520E+01
6.400E+01	2.470E+01	6.450E+01	2.180E+01	6.470E+01	2.450E+01
6.490E+01	2.680E+01	6.540E+01	3.030E+01	6.610E+01	3.530E+01
6.660E+01	3.970E+01	6.670E+01	4.120E+01	6.750E+01	3.630E+01
11R-24 Collapsing Breaker @ 62.95		Breaker height 9.1 cm			
5.850E+01	2.000E-01	5.900E+01	5.700E+00	5.940E+01	7.800E+00
5.980E+01	9.900E+00	6.010E+01	9.300E+00	6.050E+01	1.080E+01
6.060E+01	1.090E+01	6.070E+01	1.000E+01	6.090E+01	1.180E+01
6.100E+01	1.080E+01	6.120E+01	1.260E+01	6.130E+01	1.120E+01
6.150E+01	1.270E+01	6.150E+01	1.170E+01	6.170E+01	1.310E+01
6.180E+01	1.220E+01	6.200E+01	1.400E+01	6.210E+01	1.360E+01
6.220E+01	1.480E+01	6.240E+01	1.640E+01	6.270E+01	2.300E+01
6.340E+01	2.610E+01	6.370E+01	2.680E+01	6.410E+01	2.710E+01
6.440E+01	2.590E+01	6.470E+01	2.620E+01	6.500E+01	2.480E+01
6.520E+01	2.890E+01	6.580E+01	3.200E+01	6.650E+01	3.670E+01
6.670E+01	3.970E+01	6.670E+01	4.000E+01	6.700E+01	3.710E+01
6.750E+01	3.650E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
12R-1 Plunging Breaker @ 63.5		Breaker height 9 cm			
5.740E+01	6.000E-01	5.880E+01	7.300E+00	6.030E+01	1.250E+01
6.230E+01	1.990E+01	6.510E+01	2.880E+01	6.700E+01	3.370E+01
6.770E+01	3.770E+01	6.800E+01	4.030E+01		
12R-1 Plunging Breaker @ 63.7		Breaker height 8.5 cm			
5.790E+01	1.400E+00	5.890E+01	7.000E+00	5.950E+01	8.200E+00
5.970E+01	9.300E+00	5.990E+01	1.070E+01	6.000E+01	1.100E+01
6.010E+01	1.200E+01	6.020E+01	1.100E+01	6.030E+01	1.240E+01
6.050E+01	1.150E+01	6.060E+01	1.320E+01	6.070E+01	1.250E+01
6.090E+01	1.340E+01	6.090E+01	1.270E+01	6.170E+01	1.580E+01
6.210E+01	1.580E+01	6.230E+01	1.700E+01	6.280E+01	1.880E+01
6.310E+01	1.990E+01	6.350E+01	2.060E+01	6.360E+01	2.160E+01
6.370E+01	2.130E+01	6.380E+01	2.360E+01	6.420E+01	2.560E+01
6.450E+01	2.560E+01	6.510E+01	2.940E+01	6.570E+01	3.330E+01
6.630E+01	3.660E+01	6.700E+01	3.500E+01	6.800E+01	4.000E+01
12R-5 Collapsing Breaker @ 62.95		Breaker height 9.3 cm			
5.760E+01	2.200E+00	5.770E+01	1.800E+00	5.810E+01	3.500E+00
5.820E+01	4.600E+00	5.820E+01	3.600E+00	5.850E+01	5.300E+00
5.860E+01	4.800E+00	5.860E+01	6.000E+00	5.820E+01	5.400E+00
5.880E+01	6.700E+00	5.890E+01	6.200E+00	5.910E+01	6.700E+00
5.920E+01	7.800E+00	5.920E+01	7.300E+00	5.940E+01	8.500E+00
5.950E+01	7.500E+00	5.960E+01	8.500E+00	5.970E+01	7.900E+00
5.980E+01	9.000E+00	5.990E+01	8.300E+00	6.000E+01	9.500E+00
6.000E+01	9.000E+00	6.010E+01	1.030E+01	6.020E+01	9.600E+00
6.040E+01	1.080E+01	6.050E+01	1.000E+01	6.060E+01	1.220E+01
6.070E+01	1.130E+01	6.090E+01	1.280E+01	6.100E+01	1.270E+01
6.110E+01	1.360E+01	6.120E+01	1.300E+01	6.140E+01	1.540E+01
6.150E+01	1.350E+01	6.190E+01	1.880E+01	6.200E+01	1.940E+01
6.220E+01	2.250E+01	6.260E+01	2.420E+01	6.290E+01	2.480E+01
6.320E+01	2.330E+01	6.340E+01	2.070E+01	6.360E+01	2.030E+01
6.380E+01	2.130E+01	6.390E+01	2.280E+01	6.420E+01	2.240E+01
6.460E+01	2.400E+01	6.480E+01	2.430E+01	6.490E+01	2.660E+01
6.600E+01	3.090E+01	6.700E+01	3.730E+01	6.710E+01	3.820E+01
6.750E+01	3.750E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
12R=24 Collapsing Breaker @ 62.55		Breaker height 9 cm			
5.710E+01	2.500E+00	5.720E+01	3.700E+00	5.730E+01	2.600E+00
5.740E+01	4.000E+00	5.750E+01	2.900E+00	5.770E+01	4.200E+00
5.780E+01	2.800E+00	5.800E+01	3.700E+00	5.800E+01	2.800E+00
5.810E+01	3.800E+00	5.820E+01	2.700E+00	5.830E+01	3.800E+00
5.840E+01	2.700E+00	5.850E+01	3.600E+00	5.850E+01	2.800E+00
5.860E+01	3.800E+00	5.870E+01	3.200E+00	5.870E+01	4.000E+00
5.880E+01	3.500E+00	5.890E+01	4.700E+00	5.900E+01	4.100E+00
5.910E+01	5.600E+00	5.920E+01	4.700E+00	5.930E+01	5.700E+00
5.940E+01	5.600E+00	5.990E+01	7.800E+00	6.030E+01	8.800E+00
6.050E+01	1.010E+01	6.060E+01	1.170E+01	6.100E+01	1.280E+01
6.110E+01	1.170E+01	6.140E+01	1.480E+01	6.150E+01	1.340E+01
6.170E+01	1.600E+01	6.190E+01	1.450E+01	6.230E+01	2.240E+01
6.280E+01	2.460E+01	6.320E+01	2.530E+01	6.360E+01	2.370E+01
6.420E+01	2.030E+01	6.450E+01	2.080E+01	6.490E+01	2.290E+01
6.520E+01	2.400E+01	6.540E+01	2.770E+01	6.640E+01	3.250E+01
6.740E+01	3.900E+01	6.750E+01	3.970E+01	6.780E+01	3.820E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
13R-1 Plunging Breaker @ 63.15		Breaker height 8.8 cm			
5.800E+01	3.000E-01	5.880E+01	6.200E+00	5.990E+01	1.000E+01
6.090E+01	1.480E+01	6.270E+01	2.180E+01	6.470E+01	2.700E+01
6.610E+01	3.260E+01	6.790E+01	3.790E+01		
13R-1 Collapsing Breaker @ 63.2		Breaker height 9.4 cm			
5.800E+01	4.000E-01	5.870E+01	5.200E+00	5.930E+01	8.300E+00
6.000E+01	1.050E+01	6.060E+01	1.200E+01	6.110E+01	1.210E+01
6.130E+01	1.170E+01	6.150E+01	1.320E+01	6.190E+01	1.480E+01
6.210E+01	1.530E+01	6.220E+01	1.440E+01	6.250E+01	1.820E+01
6.270E+01	2.190E+01	6.300E+01	2.420E+01	6.340E+01	2.540E+01
6.360E+01	2.540E+01	6.380E+01	2.350E+01	6.400E+01	2.230E+01
6.430E+01	2.370E+01	6.440E+01	2.500E+01	6.460E+01	2.670E+01
6.550E+01	3.200E+01	6.630E+01	3.730E+01	6.650E+01	3.890E+01
6.700E+01	3.630E+01	6.750E+01	3.700E+01		
13R-5 Collapsing Breaker @ 62.7		Breaker height 8.8 cm			
5.800E+01	3.000E-01	5.870E+01	5.400E+00	5.880E+01	6.300E+00
5.890E+01	7.200E+00	5.900E+01	6.000E+00	5.910E+01	6.800E+00
5.910E+01	6.800E+00	5.930E+01	7.800E+00	5.940E+01	7.700E+00
5.950E+01	9.300E+00	5.960E+01	8.700E+00	5.980E+01	1.080E+01
5.990E+01	9.800E+00	6.010E+01	1.100E+01	6.020E+01	9.400E+00
6.050E+01	1.090E+01	6.060E+01	9.500E+00	6.080E+01	1.120E+01
6.110E+01	1.160E+01	6.130E+01	1.320E+01	6.170E+01	1.320E+01
6.210E+01	1.440E+01	6.220E+01	1.440E+01	6.240E+01	1.780E+01
6.270E+01	2.290E+01	6.310E+01	2.540E+01	6.360E+01	2.690E+01
6.410E+01	2.680E+01	6.450E+01	2.650E+01	6.480E+01	2.650E+01
6.490E+01	2.560E+01	6.500E+01	2.580E+01	6.510E+01	2.850E+01
6.570E+01	3.190E+01	6.620E+01	3.580E+01	6.650E+01	3.910E+01
6.660E+01	4.040E+01	6.720E+01	3.660E+01	6.750E+01	3.710E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
13R-24 Collapsing Breaker @ 61.95		Breaker height 9.2 cm			
5.800E+01	3.000E-01	5.840E+01	3.700E+00	5.860E+01	4.800E+00
5.900E+01	5.700E+00	5.920E+01	5.600E+00	5.970E+01	9.000E+00
5.980E+01	1.140E+01	6.010E+01	1.110E+01	6.020E+01	1.170E+01
6.030E+01	1.040E+01	6.050E+01	1.170E+01	6.060E+01	1.000E+01
6.080E+01	1.150E+01	6.080E+01	1.040E+01	6.100E+01	1.160E+01
6.100E+01	1.070E+01	6.110E+01	1.200E+01	6.120E+01	1.140E+01
6.140E+01	1.480E+01	6.170E+01	1.960E+01	6.180E+01	2.340E+01
6.240E+01	2.650E+01	6.290E+01	2.700E+01	6.330E+01	2.400E+01
6.380E+01	2.360E+01	6.430E+01	2.240E+01	6.460E+01	2.240E+01
6.480E+01	2.350E+01	6.480E+01	2.470E+01	6.500E+01	2.810E+01
6.510E+01	2.960E+01	6.560E+01	3.270E+01	6.610E+01	3.610E+01
6.640E+01	3.960E+01	6.650E+01	4.150E+01	6.720E+01	3.660E+01
6.750E+01	3.720E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
14A-1 Plunging Breaker @ 62.95		Breaker height 9 cm			
5.790E+01	3.000E-01	5.910E+01	8.300E+00	6.030E+01	1.380E+01
6.200E+01	2.040E+01	6.360E+01	2.550E+01	6.500E+01	2.950E+01
6.620E+01	3.330E+01	6.700E+01	3.520E+01	6.800E+01	3.680E+01
14A-1 Collapsing Breaker @ 62.65		Breaker height 9 cm			
5.790E+01	4.000E-01	5.850E+01	5.000E+00	5.910E+01	8.800E+00
5.950E+01	1.010E+01	5.990E+01	1.090E+01	6.000E+01	1.230E+01
6.010E+01	1.170E+01	6.020E+01	1.230E+01	6.030E+01	1.170E+01
6.050E+01	1.320E+01	6.060E+01	1.250E+01	6.070E+01	1.330E+01
6.080E+01	1.210E+01	6.100E+01	1.460E+01	6.110E+01	1.420E+01
6.130E+01	1.540E+01	6.140E+01	1.410E+01	6.150E+01	1.590E+01
6.170E+01	1.500E+01	6.190E+01	1.700E+01	6.200E+01	1.600E+01
6.230E+01	2.180E+01	6.260E+01	2.330E+01	6.310E+01	2.500E+01
6.340E+01	2.300E+01	6.350E+01	2.190E+01	6.370E+01	2.190E+01
6.410E+01	2.480E+01	6.420E+01	2.650E+01	6.520E+01	3.150E+01
6.640E+01	3.610E+01	6.710E+01	3.730E+01	6.750E+01	3.840E+01
14A-5 Collapsing Breaker @ 62.1		Breaker height 9.1 cm			
5.790E+01	3.000E-01	5.820E+01	3.400E+00	5.860E+01	6.100E+00
5.880E+01	7.400E+00	5.910E+01	8.600E+00	5.950E+01	7.700E+00
5.980E+01	9.400E+00	6.000E+01	1.010E+01	6.010E+01	1.230E+01
6.040E+01	1.200E+01	6.050E+01	1.460E+01	6.070E+01	1.420E+01
6.080E+01	1.580E+01	6.100E+01	1.450E+01	6.120E+01	1.670E+01
6.140E+01	1.480E+01	6.160E+01	1.920E+01	6.170E+01	1.820E+01
6.200E+01	2.350E+01	6.240E+01	2.550E+01	6.270E+01	2.500E+01
6.300E+01	2.340E+01	6.320E+01	2.280E+01	6.340E+01	2.380E+01
6.390E+01	2.190E+01	6.430E+01	2.500E+01	6.450E+01	2.580E+01
6.460E+01	2.780E+01	6.490E+01	2.790E+01	6.530E+01	2.530E+01
6.550E+01	2.900E+01	6.620E+01	3.250E+01	6.690E+01	3.860E+01
6.710E+01	3.760E+01	6.750E+01	3.850E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
14B-24 Collapsing Breaker @ 62.3		Breaker height 9.1 cm			
5.800E+01	4.000E-01	5.850E+01	5.000F+00	5.900E+01	7.100E+00
5.920E+01	6.700F+00	5.970E+01	8.800F+00	5.990E+01	9.000E+00
6.000E+01	1.080E+01	6.020E+01	1.010E+01	6.030E+01	1.230E+01
6.040E+01	1.170F+01	6.060E+01	1.300F+01	6.070E+01	1.110F+01
6.090E+01	1.330F+01	6.110E+01	1.170E+01	6.120E+01	1.320F+01
6.130E+01	1.180E+01	6.160E+01	1.530E+01	6.170E+01	1.490E+01
6.210E+01	2.320E+01	6.260E+01	2.540E+01	6.320F+01	2.650E+01
6.340F+01	2.560E+01	6.380E+01	2.260E+01	6.400E+01	2.140E+01
6.450E+01	2.210E+01	6.490E+01	2.080E+01	6.500F+01	2.240E+01
6.510E+01	2.240E+01	6.520F+01	2.340E+01	6.520E+01	2.370E+01
6.550E+01	2.870E+01	6.560F+01	2.870E+01	6.560E+01	2.980F+01
6.620F+01	3.260F+01	6.710E+01	4.030F+01	6.720E+01	4.100E+01
6.750F+01	3.830E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
15R-1 Plunging Breaker @ 64.65		Breaker height 5.2 cm			
5.810E+01	4.000E-01	5.870E+01	5.500E+00	5.940E+01	1.050E+01
6.030E+01	1.450E+01	6.120E+01	1.880E+01	6.300E+01	2.200E+01
6.470E+01	2.720E+01	6.610E+01	3.200E+01	6.750E+01	3.710E+01
15R-1 Plunging Breaker @ 64.7		Breaker height 5.2 cm			
5.810E+01	4.000E-01	5.870E+01	5.800E+00	5.930E+01	1.040E+01
6.000E+01	1.310E+01	6.070E+01	1.590E+01	6.110E+01	1.810E+01
6.200E+01	2.000E+01	6.350E+01	2.320E+01	6.360E+01	2.370E+01
6.410E+01	2.350E+01	6.430E+01	2.380E+01	6.450E+01	2.440E+01
6.470E+01	2.720E+01	6.510E+01	2.870E+01	6.570E+01	3.140E+01
6.620E+01	3.460E+01	6.640E+01	3.320E+01	6.730E+01	3.640E+01
15R-5 Collapsing Breaker @ 64.6		Breaker height 5.3 cm			
5.820E+01	6.000E-01	5.860E+01	5.000E+00	5.890E+01	7.900E+00
5.960E+01	1.130E+01	6.010E+01	1.350E+01	6.070E+01	1.510E+01
6.130E+01	1.880E+01	6.160E+01	1.890E+01	6.220E+01	2.040E+01
6.280E+01	2.130E+01	6.330E+01	2.270E+01	6.370E+01	2.310E+01
6.430E+01	2.370E+01	6.450E+01	2.680E+01	6.480E+01	2.860E+01
6.510E+01	2.870E+01	6.530E+01	2.840E+01	6.550E+01	3.000E+01
6.590E+01	3.260E+01	6.610E+01	3.470E+01	6.620E+01	3.530E+01
6.620E+01	3.480E+01	6.630E+01	3.540E+01	6.650E+01	3.370E+01
6.750E+01	3.710E+01				
15R-24 Collapsing Breaker @ 64.65		Breaker height 5.5 cm			
5.820E+01	4.000E-01	5.860E+01	4.400E+00	5.920E+01	9.300E+00
5.990E+01	1.230E+01	6.040E+01	1.480E+01	6.080E+01	1.680E+01
6.140E+01	1.900E+01	6.210E+01	2.020E+01	6.250E+01	2.050E+01
6.300E+01	2.180E+01	6.340E+01	2.270E+01	6.380E+01	2.310E+01
6.420E+01	2.310E+01	6.430E+01	2.310E+01	6.440E+01	2.430E+01
6.460E+01	2.770E+01	6.480E+01	2.890E+01	6.510E+01	2.940E+01
6.530E+01	2.840E+01	6.540E+01	2.950E+01	6.570E+01	3.140E+01
6.600E+01	3.330E+01	6.620E+01	3.510E+01	6.650E+01	3.360E+01
6.750E+01	3.700E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
16B-1 Plunging Breaker @ 64.95		Breaker height 5.4 cm			
5.840E+01	3.000E-01	5.920E+01	6.600E+00	6.020E+01	1.160E+01
6.150E+01	1.650E+01	6.270E+01	2.140E+01	6.440E+01	2.530E+01
6.560E+01	3.040E+01	6.690E+01	3.570E+01	6.780E+01	3.880E+01
16B-1 Plunging Breaker @ 64.85		Breaker height 5.6 cm			
5.850E+01	6.000E-01	5.890E+01	4.200E+00	5.940E+01	8.000E+00
6.000E+01	1.100E+01	6.090E+01	1.440E+01	6.160E+01	1.700E+01
6.230E+01	2.000E+01	6.310E+01	2.230E+01	6.390E+01	2.350E+01
6.450E+01	2.500E+01	6.460E+01	2.740E+01	6.490E+01	2.830E+01
6.520E+01	2.740E+01	6.540E+01	2.880E+01	6.590E+01	3.080E+01
6.640E+01	3.390E+01	6.640E+01	3.460E+01	6.730E+01	3.600E+01
16B-5 Plunging Breaker @ 64.8		Breaker height 5.2 cm			
5.850E+01	4.000E-01	5.920E+01	6.200E+00	5.980E+01	1.030E+01
6.060E+01	1.340E+01	6.110E+01	1.460E+01	6.180E+01	1.770E+01
6.260E+01	2.080E+01	6.320E+01	2.230E+01	6.340E+01	2.270E+01
6.380E+01	2.270E+01	6.400E+01	2.330E+01	6.420E+01	2.670E+01
6.440E+01	2.820E+01	6.470E+01	2.830E+01	6.490E+01	2.610E+01
6.500E+01	2.610E+01	6.520E+01	2.750E+01	6.540E+01	2.710E+01
6.550E+01	2.780E+01	6.560E+01	2.910E+01	6.610E+01	3.140E+01
6.640E+01	3.380E+01	6.650E+01	3.480E+01	6.660E+01	3.400E+01
6.750E+01	3.800E+01				
16B-24 Collapsing Breaker @ 64.8		Breaker height 5.8 cm			
5.840E+01	4.000E-01	5.900E+01	5.200E+00	5.960E+01	9.200E+00
6.020E+01	1.200E+01	6.100E+01	1.440E+01	6.160E+01	1.710E+01
6.220E+01	1.950E+01	6.300E+01	2.200E+01	6.340E+01	2.250E+01
6.370E+01	2.110E+01	6.390E+01	2.140E+01	6.410E+01	2.200E+01
6.420E+01	2.260E+01	6.440E+01	2.440E+01	6.460E+01	2.770E+01
6.490E+01	2.890E+01	6.520E+01	2.880E+01	6.530E+01	2.830E+01
6.550E+01	2.930E+01	6.570E+01	2.980E+01	6.610E+01	3.190E+01
6.640E+01	3.480E+01	6.650E+01	3.570E+01	6.660E+01	3.420E+01
6.720E+01	3.660E+01	6.750E+01	3.790E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
17A-1 Plunging Breaker @ 62.85		Breaker height 8.8 cm			
5.850E+01	1.000E-01	5.920E+01	7.400E+00	5.970E+01	1.180E+01
6.020E+01	1.500E+01	6.090E+01	1.700E+01	6.230E+01	2.080E+01
6.370E+01	2.470E+01	6.480E+01	2.810E+01	6.590E+01	3.170E+01
6.700E+01	3.570E+01	6.800E+01	3.820E+01		
17A-1 Collapsing Breaker @ 62.9		Breaker height 9 cm			
5.840E+01	5.000E-01	5.880E+01	4.700E+00	5.890E+01	4.000E+00
5.930E+01	8.300E+00	5.940E+01	7.800E+00	5.970E+01	1.040E+01
5.980E+01	1.030E+01	5.990E+01	1.130E+01	6.000E+01	1.050E+01
6.010E+01	1.250E+01	6.030E+01	1.150E+01	6.040E+01	1.280E+01
6.050E+01	1.190E+01	6.060E+01	1.310E+01	6.070E+01	1.210E+01
6.080E+01	1.360E+01	6.100E+01	1.280E+01	6.110E+01	1.400E+01
6.120E+01	1.380E+01	6.140E+01	1.550E+01	6.150E+01	1.490E+01
6.170E+01	1.630E+01	6.180E+01	1.520E+01	6.210E+01	1.800E+01
6.220E+01	1.680E+01	6.250E+01	1.990E+01	6.260E+01	2.020E+01
6.280E+01	2.280E+01	6.310E+01	2.420E+01	6.340E+01	2.490E+01
6.360E+01	2.460E+01	6.390E+01	2.330E+01	6.430E+01	2.660E+01
6.470E+01	2.880E+01	6.520E+01	3.230E+01	6.560E+01	3.420E+01
6.590E+01	3.480E+01	6.620E+01	3.480E+01	6.650E+01	3.580E+01
6.680E+01	3.550E+01	6.690E+01	3.480E+01	6.720E+01	3.580E+01
6.800E+01	3.750E+01				
17A-5 Collapsing Breaker @ 62.15		Breaker height 9.1 cm			
5.830E+01	4.000E-01	5.840E+01	2.300E+00	5.850E+01	1.800E+00
5.870E+01	4.600E+00	5.880E+01	4.200E+00	5.900E+01	6.200E+00
5.910E+01	5.800E+00	5.920E+01	6.900E+00	6.040E+01	1.130E+01
6.060E+01	1.330E+01	6.070E+01	1.220E+01	6.100E+01	1.550E+01
6.110E+01	1.400E+01	6.150E+01	1.860E+01	6.190E+01	2.270E+01
6.240E+01	2.440E+01	6.290E+01	2.220E+01	6.320E+01	2.100E+01
6.350E+01	2.140E+01	6.390E+01	2.280E+01	6.420E+01	2.410E+01
6.440E+01	2.650E+01	6.470E+01	2.720E+01	6.500E+01	2.680E+01
6.590E+01	3.200E+01	6.680E+01	3.740E+01	6.710E+01	3.580E+01
6.800E+01	3.770E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
178-24 Collapsing Breaker @ 62.45		Breaker height 9.2 cm			
5.750E+01	1.000E+00	5.760E+01	2.300E+00	5.770E+01	1.700E+00
5.780E+01	2.600E+00	5.790E+01	1.700E+00	5.800E+01	2.800E+00
5.810E+01	2.000E+00	5.820E+01	3.000E+00	5.830E+01	2.200E+00
5.840E+01	3.300E+00	5.850E+01	2.500E+00	5.850E+01	3.600E+00
5.860E+01	3.100E+00	5.870E+01	4.100E+00	5.880E+01	3.600E+00
5.880E+01	4.400E+00	5.890E+01	4.000E+00	5.900E+01	5.500E+00
5.920E+01	4.700E+00	5.930E+01	6.300E+00	5.940E+01	6.300E+00
5.950E+01	7.800E+00	5.960E+01	7.000E+00	5.980E+01	9.300E+00
5.990E+01	8.400E+00	6.010E+01	1.050E+01	6.020E+01	9.500E+00
6.040E+01	1.160E+01	6.050E+01	1.060E+01	6.080E+01	1.320E+01
6.090E+01	1.220E+01	6.120E+01	1.540E+01	6.140E+01	1.400E+01
6.190E+01	1.930E+01	6.230E+01	2.330E+01	6.280E+01	2.510E+01
6.330E+01	2.220E+01	6.350E+01	2.140E+01	6.420E+01	2.170E+01
6.450E+01	2.270E+01	6.490E+01	2.740E+01	6.550E+01	2.940E+01
6.610E+01	3.230E+01	6.710E+01	3.850E+01	6.750E+01	3.660E+01
6.800E+01	3.760E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
18R-1 Plunging Breaker @ 63.35		Breaker height 9.1 cm			
5.850E+01	2.000E-01	5.890E+01	4.800E+00	5.930E+01	8.600E+00
5.980E+01	1.220E+01	6.050E+01	1.490E+01	6.140E+01	1.740E+01
6.260E+01	2.140E+01	6.360E+01	2.420E+01	6.460E+01	2.720E+01
6.580E+01	3.140E+01	6.690E+01	3.530E+01	6.800E+01	3.880E+01
18R-1 Plunging Breaker @ 64.3		Breaker height 9 cm			
5.850E+01	4.000E-01	5.870E+01	4.300E+00	5.880E+01	4.000E+00
5.890E+01	4.800E+00	5.910E+01	9.400E+00	5.940E+01	8.800E+00
5.940E+01	1.050E+01	5.960E+01	1.000E+01	5.980E+01	1.200E+01
5.990E+01	9.800E+00	6.030E+01	1.260E+01	6.040E+01	1.080E+01
6.060E+01	1.200E+01	6.070E+01	1.090E+01	6.080E+01	1.290E+01
6.090E+01	1.250E+01	6.100E+01	1.360E+01	6.110E+01	1.260E+01
6.120E+01	1.350E+01	6.130E+01	1.260E+01	6.150E+01	1.390E+01
6.150E+01	1.270E+01	6.160E+01	1.370E+01	6.170E+01	1.290E+01
6.180E+01	1.350E+01	6.180E+01	1.290E+01	6.190E+01	1.440E+01
6.200E+01	1.400E+01	6.210E+01	1.560E+01	6.220E+01	1.500E+01
6.230E+01	1.640E+01	6.260E+01	1.780E+01	6.290E+01	1.900E+01
6.310E+01	1.700E+01	6.350E+01	2.030E+01	6.370E+01	1.920E+01
6.380E+01	2.080E+01	6.420E+01	2.180E+01	6.420E+01	2.170E+01
6.440E+01	2.380E+01	6.450E+01	2.480E+01	6.510E+01	2.480E+01
6.530E+01	2.730E+01	6.600E+01	3.180E+01	6.670E+01	3.860E+01
6.690E+01	3.900E+01	6.750E+01	3.550E+01		
18R-5 Collapsing Breaker @ 62.7		Breaker height 9.2 cm			
5.810E+01	6.000E-01	5.840E+01	2.600E+00	5.850E+01	4.200E+00
5.860E+01	5.200E+00	5.870E+01	6.000E+00	5.880E+01	5.600E+00
5.890E+01	7.200E+00	5.900E+01	6.600E+00	5.920E+01	7.300E+00
5.930E+01	8.200E+00	5.940E+01	7.800E+00	5.950E+01	9.000E+00
5.960E+01	7.400E+00	5.970E+01	8.400E+00	5.980E+01	7.800E+00
5.990E+01	8.800E+00	6.000E+01	8.400E+00	6.010E+01	9.700E+00
6.020E+01	8.800E+00	6.030E+01	1.030E+01	6.040E+01	9.700E+00
6.050E+01	1.100E+01	6.060E+01	1.050E+01	6.070E+01	1.180E+01
6.090E+01	1.130E+01	6.100E+01	1.330E+01	6.120E+01	1.170E+01
6.140E+01	1.370E+01	6.150E+01	1.220E+01	6.170E+01	1.380E+01
6.180E+01	1.240E+01	6.200E+01	1.650E+01	6.210E+01	1.700E+01
6.240E+01	2.240E+01	6.280E+01	2.450E+01	6.320E+01	2.480E+01
6.370E+01	2.190E+01	6.410E+01	2.470E+01	6.460E+01	2.540E+01
6.520E+01	2.580E+01	6.530E+01	2.520E+01	6.550E+01	2.680E+01
6.560E+01	2.610E+01	6.570E+01	2.710E+01	6.660E+01	3.160E+01
6.760E+01	3.630E+01	6.770E+01	3.940E+01	6.800E+01	3.940E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
188-24 Collapsing Breaker @ 62.6		Breaker height 8.9 cm			
5.820E+01	4.000E-01	5.830E+01	1.400E+00	5.830E+01	5.000E-01
5.840E+01	1.600E+00	5.850E+01	1.000E+00	5.850E+01	2.000E+00
5.860E+01	1.400E+00	5.870E+01	2.600E+00	5.880E+01	2.300E+00
5.880E+01	3.200E+00	5.890E+01	2.400E+00	5.900E+01	3.600E+00
5.900E+01	3.000E+00	5.910E+01	4.300E+00	5.920E+01	3.700E+00
5.920E+01	5.000E+00	5.930E+01	6.600E+00	5.940E+01	8.200E+00
5.950E+01	7.500E+00	5.970E+01	9.800E+00	5.980E+01	8.600E+00
6.000E+01	1.100E+01	6.010E+01	1.000E+01	6.030E+01	1.200E+01
5.930E+01	4.700E+00	5.940E+01	5.800E+00	5.950E+01	5.200E+00
5.960E+01	6.400E+00	5.970E+01	5.500E+00	5.980E+01	7.500E+00
5.980E+01	7.200E+00	5.990E+01	8.700E+00	6.000E+01	8.200E+00
6.020E+01	1.030E+01	6.030E+01	9.800E+00	6.040E+01	1.150E+01
6.050E+01	1.050E+01	6.080E+01	1.260E+01	6.090E+01	1.150E+01
6.120E+01	1.370E+01	6.130E+01	1.210E+01	6.150E+01	1.420E+01
6.160E+01	1.280E+01	6.180E+01	1.500E+01	6.190E+01	1.390E+01
6.210E+01	1.720E+01	6.220E+01	1.680E+01	6.260E+01	2.280E+01
6.300E+01	2.480E+01	6.330E+01	2.500E+01	6.370E+01	2.180E+01
6.410E+01	2.040E+01	6.430E+01	1.920E+01	6.440E+01	2.100E+01
6.490E+01	2.000E+01	6.500E+01	2.140E+01	6.530E+01	2.350E+01
6.540E+01	2.420E+01	6.560E+01	2.140E+01	6.640E+01	3.240E+01
6.770E+01	3.940E+01	6.800E+01	3.940E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
19R-I Collapsing Breaker @ 64.45		Breaker height 5.2 cm			
5.790E+01	2.000E-01	5.840E+01	2.000E+00	5.920E+01	7.500E+00
6.010E+01	1.060E+01	6.090E+01	1.320E+01	6.150E+01	1.650E+01
6.250E+01	2.120E+01	6.350E+01	2.370E+01	6.470E+01	2.630E+01
6.570E+01	3.040E+01	6.700E+01	3.490E+01	6.800E+01	3.750E+01
19R-1 Plunging Breaker @ 64.4		Breaker height 5.4 cm			
5.790E+01	2.000E-01	5.900E+01	6.800E+00	6.010E+01	1.050E+01
6.130E+01	1.480E+01	6.210E+01	1.980E+01	6.310E+01	2.150E+01
6.370E+01	2.280E+01	6.410E+01	2.450E+01	6.430E+01	2.500E+01
6.440E+01	2.670E+01	6.470E+01	2.750E+01	6.490E+01	2.800E+01
6.560E+01	3.230E+01	6.600E+01	3.330E+01	6.630E+01	3.280E+01
6.750E+01	3.660E+01				
19R-5 Plunging Breaker @ 64.75		Breaker height 6 cm			
5.800E+01	5.000E-01	5.850E+01	3.000E+00	5.910E+01	7.000E+00
5.990E+01	9.100E+00	6.070E+01	1.220E+01	6.110E+01	1.360E+01
6.170E+01	1.730E+01	6.230E+01	2.000E+01	6.290E+01	2.020E+01
6.330E+01	1.980E+01	6.350E+01	2.160E+01	6.350E+01	2.130E+01
6.360E+01	2.240E+01	6.370E+01	2.200E+01	6.380E+01	2.280E+01
6.380E+01	2.240E+01	6.400E+01	2.380E+01	6.400E+01	2.350E+01
6.430E+01	2.630E+01	6.460E+01	2.730E+01	6.510E+01	2.980E+01
6.560E+01	3.250E+01	6.580E+01	3.380E+01	6.640E+01	3.310E+01
6.750E+01	3.650E+01				
19R-24 Plunging Breaker @ 64.0		Breaker height 5.6 cm			
5.790E+01	2.000E-01	5.830E+01	2.200E+00	5.880E+01	5.100E+00
5.920E+01	7.300E+00	5.990E+01	9.400E+00	6.070E+01	1.220E+01
6.100E+01	1.320E+01	6.150E+01	1.630E+01	6.190E+01	1.880E+01
6.230E+01	2.000E+01	6.250E+01	1.900E+01	6.290E+01	2.000E+01
6.290E+01	2.060F+01	6.300F+01	2.000E+01	6.310E+01	2.110E+01
6.310E+01	2.070E+01	6.320E+01	2.180F+01	6.330E+01	2.120F+01
6.340E+01	2.220F+01	6.340F+01	2.180E+01	6.360E+01	2.350E+01
6.370E+01	2.360E+01	6.400E+01	2.710E+01	6.440E+01	2.830E+01
6.470E+01	2.750F+01	6.520E+01	2.860E+01	6.560E+01	3.030E+01
6.600E+01	3.230E+01	6.630E+01	3.450F+01	6.670E+01	3.380E+01
6.750F+01	3.660E+01	6.800F+01	3.750E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
20R=1 Collapsing Breaker @ 65.0		Breaker height 5 cm			
5.800E+01	4.000E-01	5.900E+01	5.300E+00	5.980E+01	1.040E+01
6.110E+01	1.240E+01	6.220E+01	1.760E+01	6.380E+01	2.170E+01
6.530E+01	2.550E+01	6.680E+01	3.320E+01	6.790E+01	3.840E+01
20R=1 Plunging Breaker @ 64.85		Breaker height 5 cm			
5.800E+01	2.000E-01	5.880E+01	4.600E+00	5.970E+01	1.000E+01
6.060E+01	1.080E+01	6.150E+01	1.410E+01	6.240E+01	1.810E+01
6.270E+01	1.880E+01	6.280E+01	2.000E+01	6.280E+01	1.980E+01
6.290E+01	2.060E+01	6.300E+01	2.000E+01	6.310E+01	2.100E+01
6.320E+01	2.020E+01	6.330E+01	2.100E+01	6.330E+01	2.030E+01
6.340E+01	2.130E+01	6.340E+01	2.070E+01	6.360E+01	2.180E+01
6.360E+01	2.100E+01	6.370E+01	2.180E+01	6.380E+01	2.100E+01
6.390E+01	2.180E+01	6.390E+01	2.120E+01	6.400E+01	2.230E+01
6.410E+01	2.180E+01	6.420E+01	2.300E+01	6.430E+01	2.240E+01
6.440E+01	2.350E+01	6.440E+01	2.260E+01	6.460E+01	2.360E+01
6.460E+01	2.290E+01	6.470E+01	2.420E+01	6.480E+01	2.370E+01
6.500E+01	2.680E+01	6.520E+01	2.740E+01	6.560E+01	2.680E+01
6.610E+01	2.930E+01	6.690E+01	3.400E+01	6.780E+01	3.800E+01
20R=5 Plunging Breaker @ 65.35		Breaker height 5.5 cm			
5.800E+01	4.000E-01	5.840E+01	2.400E+00	5.900E+01	5.300E+00
5.970E+01	8.700E+00	6.020E+01	1.010E+01	6.090E+01	1.180E+01
6.150E+01	1.460E+01	6.190E+01	1.620E+01	6.200E+01	1.700E+01
6.210E+01	1.680E+01	6.210E+01	1.760E+01	6.220E+01	1.720E+01
6.220E+01	1.820E+01	6.230E+01	1.770E+01	6.230E+01	1.830E+01
6.240E+01	1.760E+01	6.250E+01	1.820E+01	6.250E+01	1.770E+01
6.260E+01	1.840E+01	6.270E+01	1.780E+01	6.280E+01	1.970E+01
6.290E+01	1.960E+01	6.290E+01	2.040E+01	6.300E+01	1.960E+01
6.310E+01	2.050E+01	6.310E+01	1.980E+01	6.320E+01	2.080E+01
6.330E+01	2.020E+01	6.340E+01	2.080E+01	6.530E+01	2.020E+01
6.380E+01	2.080E+01	6.390E+01	2.180E+01	6.420E+01	2.180E+01
6.430E+01	2.280E+01	6.440E+01	2.200E+01	6.440E+01	2.240E+01
6.450E+01	2.180E+01	6.460E+01	2.320E+01	6.470E+01	2.280E+01
6.490E+01	2.630E+01	6.510E+01	2.700E+01	6.530E+01	2.700E+01
6.550E+01	2.600E+01	6.560E+01	2.650E+01	6.610E+01	3.040E+01
6.670E+01	3.380E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
20R=24 Plunging Breaker @ 64.75		Breaker height 5.3 cm			
5.800E+01	2.000E-01	5.840E+01	2.000E+00	5.930E+01	7.200E+00
5.970E+01	1.000E+01	6.020E+01	9.600E+00	6.060E+01	1.080E+01
6.090E+01	1.180E+01	6.110E+01	1.420E+01	6.160E+01	1.540E+01
6.190E+01	1.600E+01	6.230E+01	1.710E+01	6.240E+01	1.800E+01
6.250E+01	1.870E+01	6.250E+01	1.820E+01	6.260E+01	1.900E+01
6.270E+01	1.840E+01	6.280E+01	1.930E+01	6.280E+01	1.880E+01
6.290E+01	1.940E+01	6.290E+01	1.860E+01	6.310E+01	1.840E+01
6.330E+01	1.860E+01	6.350E+01	1.920E+01	6.360E+01	1.940E+01
6.390E+01	2.020E+01	6.400E+01	2.170E+01	6.400E+01	2.140E+01
6.410E+01	2.320E+01	6.420E+01	2.240E+01	6.430E+01	2.390E+01
6.440E+01	2.300E+01	6.460E+01	2.440E+01	6.460E+01	2.340E+01
6.480E+01	2.700E+01	6.510E+01	2.870E+01	6.550E+01	2.800E+01
6.600E+01	2.910E+01	6.670E+01	3.230E+01	6.730E+01	3.480E+01
6.730E+01	3.620E+01	6.780E+01	3.830E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
21B=1 Plunging Breaker @ 64.2		Breaker height 5.9 cm			
5.820E+01	2.000E=01	5.870E+01	4.700E+00	5.940E+01	9.600E+00
6.020E+01	1.240E+01	6.100E+01	1.520E+01	6.180E+01	1.720E+01
6.240E+01	2.050E+01	6.340E+01	2.340E+01	6.480E+01	2.700E+01
6.570E+01	3.040E+01	6.660E+01	3.360E+01	6.750E+01	3.660E+01
6.800E+01	3.750E+01				
21B=1 Plunging Breaker @ 64.55		Breaker height 5.8 cm			
5.820E+01	2.000E=01	5.900E+01	6.700E+00	5.960E+01	1.020E+01
6.040E+01	1.270E+01	6.090E+01	1.450E+01	6.170E+01	1.700E+01
6.240E+01	1.980E+01	6.290E+01	2.000E+01	6.330E+01	2.170E+01
6.370E+01	2.250E+01	6.430E+01	2.280E+01	6.470E+01	2.630E+01
6.520E+01	2.880E+01	6.580E+01	3.260E+01	6.620E+01	3.490E+01
6.670E+01	3.730E+01	6.710E+01	3.530E+01	6.800E+01	3.750E+01
21B=5 Collapsing Breaker @ 64.55		Breaker height 6.7 cm			
5.820E+01	4.000E=01	5.870E+01	4.800E+00	5.910E+01	9.400E+00
5.920E+01	8.800E+00	5.930E+01	1.080E+01	5.940E+01	9.600E+00
5.980E+01	1.100E+01	5.990E+01	1.210E+01	5.990E+01	1.140E+01
6.010E+01	1.180E+01	6.020E+01	1.260E+01	6.030E+01	1.180E+01
6.050E+01	1.240E+01	6.060E+01	1.340E+01	6.060E+01	1.300E+01
6.080E+01	1.350E+01	6.090E+01	1.430E+01	6.100E+01	1.400E+01
6.100E+01	1.500E+01	6.110E+01	1.430E+01	6.130E+01	1.560E+01
6.130E+01	1.530E+01	6.140E+01	1.630E+01	6.150E+01	1.560E+01
6.160E+01	1.680E+01	6.170E+01	1.630E+01	6.180E+01	1.740E+01
6.240E+01	1.830E+01	6.250E+01	1.780E+01	6.260E+01	1.890E+01
6.270E+01	1.830E+01	6.280E+01	1.890E+01	6.290E+01	1.840E+01
6.300E+01	1.950E+01	6.310E+01	1.880E+01	6.320E+01	1.970E+01
6.330E+01	1.920E+01	6.340E+01	2.050E+01	6.350E+01	1.980E+01
6.370E+01	2.150E+01	6.370E+01	2.080E+01	6.400E+01	2.310E+01
6.430E+01	2.680E+01	6.500E+01	2.900E+01	6.580E+01	3.280E+01
6.650E+01	3.680E+01	6.680E+01	3.840E+01	6.730E+01	3.600E+01
6.800E+01	3.770E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
21B-24 Collapsing Breaker @ 63.75		Breaker height 6.4 cm			
5.820E+01	2.000E-01	5.880E+01	6.800E+00	5.940E+01	9.700E+00
6.050E+01	1.130E+01	6.060E+01	1.220E+01	6.060E+01	1.140E+01
6.070E+01	1.260E+01	6.080E+01	1.200E+01	6.090E+01	1.310E+01
6.090E+01	1.250E+01	6.110E+01	1.380E+01	6.120E+01	1.290E+01
6.130E+01	1.400E+01	6.140E+01	1.350E+01	6.150E+01	1.450E+01
6.150E+01	1.400E+01	6.170E+01	1.500E+01	6.170E+01	1.430E+01
6.180E+01	1.550E+01	6.190E+01	1.500E+01	6.200E+01	1.600E+01
6.200E+01	1.550E+01	6.210E+01	1.660E+01	6.220E+01	1.580E+01
6.230E+01	1.700E+01	6.240E+01	1.640E+01	6.250E+01	1.800E+01
6.260E+01	1.780E+01	6.270E+01	1.870E+01	6.270E+01	1.820E+01
6.280E+01	1.950E+01	6.290E+01	1.900E+01	6.310E+01	2.020E+01
6.320E+01	2.140E+01	6.320E+01	2.100E+01	6.370E+01	2.660E+01
6.410E+01	2.850E+01	6.440E+01	2.880E+01	6.470E+01	2.790E+01
6.500E+01	2.900E+01	6.530E+01	2.750E+01	6.550E+01	3.030E+01
6.610E+01	3.360E+01	6.680E+01	3.820E+01	6.730E+01	3.600E+01
6.800E+01	3.740E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
22B-1 Plunging Breaker @ 64.9		Breaker height 6 cm			
5.820E+01	2.000E-01	5.880E+01	5.100E+00	5.920E+01	8.100E+00
5.980E+01	9.600E+00	6.080E+01	1.320E+01	6.180E+01	1.560E+01
6.270E+01	1.870E+01	6.350E+01	2.120E+01	6.470E+01	2.480E+01
6.570E+01	2.860E+01	6.680E+01	3.260E+01	6.790E+01	3.840E+01
22B-1 Plunging Breaker @ 65.1		Breaker height 5.3 cm			
5.820E+01	2.000E-01	5.880E+01	5.200E+00	5.930E+01	7.800E+00
5.990E+01	8.600E+00	6.000E+01	9.800E+00	6.000E+01	1.100E+01
6.010E+01	1.080E+01	6.020E+01	1.220E+01	6.030E+01	1.170E+01
6.040E+01	1.280E+01	6.050E+01	1.220E+01	6.060E+01	1.300E+01
6.070E+01	1.200E+01	6.070E+01	1.340E+01	6.080E+01	1.300E+01
6.090E+01	1.400E+01	6.100E+01	1.360E+01	6.110E+01	1.500E+01
6.120E+01	1.380E+01	6.140E+01	1.560E+01	6.150E+01	1.480E+01
6.180E+01	1.560E+01	6.290E+01	1.830E+01	6.420E+01	2.230E+01
6.470E+01	2.230E+01	6.510E+01	2.160E+01	6.520E+01	2.080E+01
6.550E+01	2.630E+01	6.630E+01	3.220E+01	6.740E+01	3.980E+01
6.770E+01	3.800E+01	6.790E+01	3.800E+01		
22B-5 Collapsing Breaker @ 65.6		Breaker height 8.3 cm			
5.830E+01	4.000E-01	5.890E+01	6.400E+00	5.920E+01	8.000E+00
5.960E+01	9.000E+00	5.970E+01	1.020E+01	5.970E+01	9.800E+00
5.980E+01	1.050E+01	5.990E+01	9.600E+00	6.000E+01	1.130E+01
6.000E+01	1.110E+01	6.010E+01	1.170E+01	6.020E+01	1.080E+01
6.030E+01	1.200E+01	6.040E+01	1.140E+01	6.050E+01	1.350E+01
6.060E+01	1.300E+01	6.070E+01	1.400E+01	6.080E+01	1.320E+01
6.090E+01	1.460E+01	6.100E+01	1.360E+01	6.110E+01	1.460E+01
6.110E+01	1.360E+01	6.120E+01	1.440E+01	6.130E+01	1.330E+01
6.140E+01	1.420E+01	6.150E+01	1.380E+01	6.160E+01	1.530E+01
6.160E+01	1.470E+01	6.170E+01	1.560E+01	6.200E+01	1.630E+01
6.240E+01	1.740E+01	6.300E+01	1.740E+01	6.320E+01	1.720E+01
6.330E+01	1.820E+01	6.340E+01	1.740E+01	6.350E+01	1.840E+01
6.390E+01	2.020E+01	6.400E+01	1.900E+01	6.420E+01	2.080E+01
6.420E+01	1.960E+01	6.440E+01	2.110E+01	6.450E+01	2.030E+01
6.460E+01	2.200E+01	6.470E+01	2.060E+01	6.500E+01	2.420E+01
6.520E+01	2.700E+01	6.560E+01	2.950E+01	6.640E+01	3.300E+01
6.750E+01	3.900E+01	6.760E+01	4.080E+01	6.800E+01	3.880E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
22A-26 Collapsing Breaker @ 64.55		Breaker height 5.7 cm			
5.830E+01	2.000E-01	5.910E+01	7.000E+00	5.940E+01	8.800E+00
5.980E+01	1.200E+01	6.010E+01	1.210E+01	6.020E+01	1.220E+01
6.030E+01	1.160E+01	6.040E+01	1.260E+01	6.050E+01	1.160E+01
6.060E+01	1.220E+01	6.070E+01	1.140E+01	6.080E+01	1.240E+01
6.080E+01	1.180E+01	6.090E+01	1.300E+01	6.100E+01	1.200E+01
6.140E+01	1.300E+01	6.170E+01	1.470E+01	6.230E+01	1.460E+01
6.270E+01	1.420E+01	6.280E+01	1.530E+01	6.280E+01	1.450E+01
6.290E+01	1.570E+01	6.300E+01	1.500E+01	6.310E+01	1.620E+01
6.320E+01	1.530E+01	6.330E+01	1.640E+01	6.340E+01	1.560E+01
6.350E+01	1.640E+01	6.360E+01	1.540E+01	6.370E+01	1.640E+01
6.370E+01	1.550E+01	6.380E+01	1.660E+01	6.390E+01	1.600E+01
6.420E+01	1.780E+01	6.430E+01	2.070E+01	6.470E+01	2.700E+01
6.620E+01	3.280E+01	6.740E+01	3.960E+01	6.750E+01	3.960E+01
6.760E+01	4.080E+01	6.800E+01	3.860E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
23R-1 Plunging Breaker @ 64.1		Breaker height 8.1 cm			
5.820E+01	2.000E-01	5.870E+01	5.700E+00	5.930E+01	9.000E+00
6.010E+01	1.120E+01	6.070E+01	1.330E+01	6.150E+01	1.620E+01
6.230E+01	2.040E+01	6.320E+01	2.280E+01	6.420E+01	2.490E+01
6.510E+01	2.780E+01	6.580E+01	3.070E+01	6.650E+01	3.330E+01
6.730E+01	3.590E+01	6.800E+01	3.780E+01		
23R-1 Plunging Breaker @ 63.3		Breaker height 8.9 cm			
5.820E+01	2.000E-01	5.900E+01	8.000E+00	5.990E+01	1.040E+01
6.090E+01	1.390E+01	6.140E+01	1.570E+01	6.190E+01	1.720E+01
6.210E+01	1.780E+01	6.240E+01	2.000E+01	6.280E+01	2.300E+01
6.330E+01	2.700E+01	6.350E+01	2.720E+01	6.410E+01	2.370E+01
6.440E+01	2.580E+01	6.490E+01	2.560E+01	6.540E+01	2.760E+01
6.560E+01	2.980E+01	6.600E+01	3.020E+01	6.660E+01	3.300E+01
6.720E+01	3.640E+01	6.720E+01	3.570E+01	6.800E+01	3.770E+01
23R-5 Plunging Breaker @ 63.6		Breaker height 9.4 cm			
5.810E+01	2.000E-01	5.860E+01	5.900E+00	5.910E+01	8.800E+00
5.980E+01	1.080E+01	6.040E+01	1.270E+01	6.080E+01	1.340E+01
6.110E+01	1.380E+01	6.160E+01	1.570E+01	6.180E+01	1.700E+01
6.190E+01	1.700E+01	6.210E+01	1.840E+01	6.220E+01	1.760E+01
6.240E+01	1.890E+01	6.240E+01	1.830E+01	6.260E+01	2.010E+01
6.270E+01	1.980E+01	6.310E+01	2.410E+01	6.330E+01	2.640E+01
6.360E+01	2.780E+01	6.380E+01	2.770E+01	6.420E+01	2.430E+01
6.430E+01	2.460E+01	6.460E+01	2.680E+01	6.490E+01	2.560E+01
6.520E+01	2.630E+01	6.560E+01	2.820E+01	6.580E+01	3.030E+01
6.620E+01	3.050E+01	6.640E+01	3.180E+01	6.690E+01	3.420E+01
6.730E+01	3.670E+01	6.800E+01	3.780E+01		
23R-26 Plunging Breaker @ 63.8		Breaker height 8.8 cm			
5.770E+01	2.000E-01	5.850E+01	8.000E+00	5.950E+01	1.160E+01
6.040E+01	1.400E+01	6.130E+01	1.570E+01	6.180E+01	1.610E+01
6.190E+01	1.710E+01	6.190E+01	1.650E+01	6.200E+01	1.700E+01
6.210E+01	1.650E+01	6.220E+01	1.740E+01	6.220E+01	1.680E+01
6.230E+01	1.780E+01	6.240E+01	1.720E+01	6.250E+01	1.810E+01
6.260E+01	1.750E+01	6.260E+01	1.830E+01	6.270E+01	1.780E+01
6.290E+01	1.880E+01	6.290E+01	1.840E+01	6.350E+01	2.280E+01
6.380E+01	2.670E+01	6.430E+01	2.840E+01	6.470E+01	2.520E+01
6.480E+01	2.440E+01	6.510E+01	2.650E+01	6.540E+01	2.600E+01
6.580E+01	2.720E+01	6.620E+01	3.070E+01	6.670E+01	3.080E+01
6.790E+01	3.680E+01	6.800E+01	3.780E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
24R-1 Plunging Breaker @ 65.0		Breaker height 8.3 cm			
5.820E+01	2.000E-01	5.910E+01	6.800E+00	6.000E+01	1.200E+01
6.090E+01	1.220E+01	6.180E+01	1.450E+01	6.260E+01	1.540E+01
6.350E+01	2.020E+01	6.440E+01	2.220E+01	6.520E+01	2.630E+01
6.590E+01	3.020E+01	6.690E+01	3.420E+01	6.760E+01	3.780E+01
6.800E+01	4.100E+01				
24R-1 Plunging Breaker @ 63.7		Breaker height 8.5 cm			
5.820E+01	2.000E-01	5.880E+01	4.800E+00	5.930E+01	8.800E+00
5.980E+01	1.100E+01	6.050E+01	1.150E+01	6.150E+01	1.440E+01
6.210E+01	1.420E+01	6.250E+01	1.720E+01	6.280E+01	1.750E+01
6.300E+01	1.840E+01	6.340E+01	2.460E+01	6.400E+01	2.720E+01
6.430E+01	2.280E+01	6.480E+01	2.400E+01	6.540E+01	2.440E+01
6.570E+01	2.780E+01	6.580E+01	2.940E+01	6.610E+01	2.980E+01
6.640E+01	2.880E+01	6.680E+01	3.110E+01	6.780E+01	3.580E+01
6.790E+01	3.970E+01	6.800E+01	4.080E+01		
24R-5 Plunging Breaker @ 64.2		Breaker height 9.6 cm			
5.820E+01	2.000E-01	5.900E+01	7.500E+00	5.950E+01	1.010E+01
6.000E+01	1.130E+01	6.070E+01	1.240E+01	6.110E+01	1.360E+01
6.110E+01	1.460E+01	6.120E+01	1.430E+01	6.130E+01	1.530E+01
6.130E+01	1.460E+01	6.140E+01	1.530E+01	6.150E+01	1.430E+01
6.160E+01	1.480E+01	6.160E+01	1.420E+01	6.170E+01	1.500E+01
6.190E+01	1.460E+01	6.200E+01	1.580E+01	6.220E+01	1.570E+01
6.240E+01	1.740E+01	6.250E+01	1.800E+01	6.260E+01	1.790E+01
6.260E+01	1.920E+01	6.270E+01	1.940E+01	6.280E+01	2.020E+01
6.290E+01	2.020E+01	6.300E+01	2.110E+01	6.300E+01	2.030E+01
6.320E+01	2.170E+01	6.330E+01	2.100E+01	6.340E+01	2.230E+01
6.350E+01	2.180E+01	6.360E+01	2.400E+01	6.370E+01	2.640E+01
6.390E+01	2.680E+01	6.430E+01	2.850E+01	6.460E+01	2.300E+01
6.480E+01	2.360E+01	6.500E+01	2.580E+01	6.550E+01	2.500E+01
6.600E+01	2.940E+01	6.640E+01	2.870E+01	6.640E+01	3.020E+01
6.700E+01	3.100E+01	6.760E+01	3.470E+01	6.810E+01	3.580E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
248-26 Plunging Breaker @ 63.75		Breaker height 8.4 cm			
5.810E+01	2.000E-01	5.850E+01	6.200E+00	5.920E+01	9.700E+00
5.980E+01	1.220E+01	6.040E+01	1.340E+01	6.100E+01	1.480E+01
6.150E+01	1.540E+01	6.160E+01	1.630E+01	6.160E+01	1.570E+01
6.170E+01	1.640E+01	6.180E+01	1.570E+01	6.180E+01	1.650E+01
6.190E+01	1.600E+01	6.200E+01	1.680E+01	6.200E+01	1.630E+01
6.210E+01	1.680E+01	6.220E+01	1.630E+01	6.220E+01	1.700E+01
6.230E+01	1.650E+01	6.230E+01	1.730E+01	6.240E+01	1.680E+01
6.250E+01	1.760E+01	6.250E+01	1.700E+01	6.260E+01	1.820E+01
6.280E+01	1.860E+01	6.280E+01	1.810E+01	6.290E+01	1.930E+01
6.300E+01	1.890E+01	6.310E+01	1.950E+01	6.320E+01	1.880E+01
6.330E+01	2.080E+01	6.340E+01	2.040E+01	6.380E+01	2.630E+01
6.410E+01	2.860E+01	6.430E+01	2.790E+01	6.460E+01	2.440E+01
6.480E+01	2.370E+01	6.520E+01	2.580E+01	6.560E+01	2.470E+01
6.620E+01	2.650E+01	6.670E+01	2.800E+01	6.690E+01	3.080E+01
6.740E+01	3.300E+01	6.800E+01	3.680E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
25R-1 Collapsing Breaker @ 64.6		Breaker height 5.3 cm			
5.750E+01	2.000E-01	5.920E+01	1.020E+01	6.080E+01	1.570E+01
6.210E+01	1.980E+01	6.470E+01	2.700E+01	6.620E+01	3.220E+01
6.800E+01	3.820E+01				
25R-1 Collapsing Breaker @ 64.7		Breaker height 5.6 cm			
5.730E+01	2.000E-01	5.840E+01	6.300E+00	5.980E+01	1.040E+01
6.100E+01	1.360E+01	6.200E+01	1.590E+01	6.290E+01	1.900E+01
6.350E+01	2.210E+01	6.440E+01	2.570E+01	6.500E+01	2.930E+01
6.560E+01	3.000E+01	6.630E+01	3.160E+01	6.640E+01	3.280E+01
6.800E+01	3.800E+01				
25R-5 Collapsing Breaker @ 65.0		Breaker height 6.4 cm			
5.730E+01	2.000E-01	5.850E+01	6.700E+00	5.940E+01	9.200E+00
6.070E+01	1.230E+01	6.180E+01	1.540E+01	6.290E+01	1.730E+01
6.390E+01	2.250E+01	6.490E+01	2.880E+01	6.550E+01	3.040E+01
6.570E+01	3.140E+01	6.580E+01	3.320E+01	6.600E+01	3.160E+01
6.800E+01	3.780E+01				
25R-24 Collapsing Breaker @ 64.8		Breaker height 5.8 cm			
5.730E+01	2.000E-01	5.810E+01	5.100E+00	5.840E+01	7.800E+00
5.980E+01	1.040E+01	6.090E+01	1.320E+01	6.180E+01	1.520E+01
6.280E+01	1.700E+01	6.360E+01	2.140E+01	6.430E+01	2.510E+01
6.480E+01	2.800E+01	6.510E+01	2.980E+01	6.550E+01	3.060E+01
6.580E+01	3.130E+01	6.590E+01	3.340E+01	6.610E+01	3.230E+01
6.750E+01	3.650E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
26R-1 Collapsing Breaker @ 64.6		Breaker height 5.4 cm			
5.750E+01	2.000E-01	5.850E+01	7.800E+00	6.000E+01	1.420E+01
6.130E+01	1.850E+01	6.330E+01	2.320E+01	6.490E+01	2.770E+01
6.630E+01	3.270E+01	6.800E+01	3.740E+01		
26R-1 Collapsing Breaker @ 64.35		Breaker height 5.7 cm			
5.750E+01	2.000E-01	5.890E+01	6.200E+00	5.970E+01	1.000E+01
6.050E+01	1.440E+01	6.140E+01	1.780E+01	6.240E+01	2.140E+01
6.330E+01	2.510E+01	6.420E+01	2.770E+01	6.440E+01	2.780E+01
6.530E+01	2.920E+01	6.620E+01	3.030E+01	6.640E+01	3.140E+01
6.640E+01	3.300E+01	6.800E+01	3.730E+01		
26R-5 Collapsing Breaker @ 64.25		Breaker height 5.1 cm			
5.750E+01	2.000E-01	5.870E+01	5.900E+00	5.960E+01	9.400E+00
6.040E+01	1.400E+01	6.120E+01	1.630E+01	6.190E+01	1.660E+01
6.220E+01	1.660E+01	6.300E+01	2.140E+01	6.370E+01	2.540E+01
6.430E+01	2.560E+01	6.500E+01	3.060E+01	6.530E+01	3.180E+01
6.530E+01	3.360E+01	6.550E+01	3.200E+01	6.700E+01	3.480E+01
6.800E+01	3.730E+01				
26R-24 Collapsing Breaker @ 64.25		Breaker height 6 cm			
5.750E+01	2.000E-01	5.850E+01	5.200E+00	5.940E+01	8.200E+00
6.010E+01	1.180E+01	6.070E+01	1.440E+01	6.120E+01	1.560E+01
6.210E+01	1.560E+01	6.210E+01	1.650E+01	6.310E+01	2.230E+01
6.390E+01	2.640E+01	6.450E+01	2.980E+01	6.480E+01	3.050E+01
6.510E+01	3.120E+01	6.530E+01	3.240E+01	6.540E+01	3.370E+01
6.560E+01	3.180E+01	6.750E+01	3.600E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
1C-1 Collapsing Breaker @ 61.4		Breaker height 16.2 cm			
5.790E+01	2.000E-01	5.950E+01	1.230E+01	6.080E+01	1.750E+01
6.230E+01	2.220E+01	6.440E+01	2.750E+01	6.580E+01	3.160E+01
6.800E+01	3.850E+01				
1C-24 Surging and Plunging Breaker @ 61.6		Breaker height 16.2 cm			
6.030E+01	4.000E-01	6.080E+01	1.050E+01	6.110E+01	1.420E+01
6.130E+01	1.860E+01	6.210E+01	2.030E+01	6.280E+01	2.340E+01
6.450E+01	2.930E+01	6.570E+01	3.510E+01	6.640E+01	3.870E+01
6.680E+01	4.060E+01	6.700E+01	4.510E+01	6.740E+01	4.530E+01
6.800E+01	4.430E+01				
2C-1 Collapsing Breaker @ 61.4		Breaker height 16.2 cm			
5.790E+01	2.000E-01	5.950E+01	1.230E+01	6.080E+01	1.750E+01
6.230E+01	2.220E+01	6.440E+01	2.750E+01	6.580E+01	3.160E+01
6.800E+01	3.850E+01				
2C-24 Surging and Plunging Breaker @ 61.95		Breaker height 17.3 cm			
5.990E+01	2.000E-01	6.040E+01	9.300E+00	6.090E+01	1.880E+01
6.160E+01	1.970E+01	6.200E+01	2.220E+01	6.330E+01	2.530E+01
6.490E+01	3.120E+01	6.600E+01	3.510E+01	6.680E+01	3.780E+01
6.750E+01	4.100E+01	6.800E+01	4.420E+01	6.840E+01	4.700E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
3C-1 Collapsing Breaker @ 62.0		Breaker height 15.7 cm			
5.570E+01	2.000E-01	5.750E+01	5.600E+00	5.870E+01	1.030E+01
5.990E+01	1.380E+01	6.120E+01	1.820E+01	6.260E+01	2.160E+01
6.380E+01	2.600E+01	6.510E+01	3.030E+01	6.610E+01	3.260E+01
6.710E+01	3.580E+01	6.800E+01	3.840E+01		
3C-1 Surging Breaker @ 62.5		Breaker height 15 cm			
5.530E+01	3.000E-01	5.550E+01	2.300E+00	5.620E+01	2.800E+00
5.640E+01	4.000E-01	5.680E+01	1.000E+00	5.700E+01	5.400E+00
5.730E+01	7.200E+00	5.780E+01	5.000E+00	5.840E+01	4.800E+00
5.860E+01	2.200E+00	5.880E+01	4.600E+00	5.910E+01	1.600E+00
5.930E+01	5.800E+00	5.960E+01	7.600E+00	5.990E+01	6.400E+00
6.010E+01	2.900E+00	6.050E+01	7.400E+00	6.060E+01	7.000E+00
6.080E+01	3.700E+00	6.130E+01	1.040E+01	6.170E+01	6.500E+00
6.220E+01	1.440E+01	6.280E+01	2.160E+01	6.340E+01	2.300E+01
6.390E+01	2.610E+01	6.420E+01	2.740E+01	6.510E+01	3.030E+01
6.610E+01	3.460E+01	6.740E+01	4.060E+01	6.840E+01	4.480E+01
6.900E+01	4.780E+01				
3C-5 Surging Breaker @ 62.65		Breaker height 15.5 cm			
5.700E+01	2.000E-01	5.740E+01	3.300E+00	5.780E+01	3.100E+00
5.840E+01	4.000E+00	5.860E+01	2.800E+00	5.880E+01	0.
5.930E+01	4.300E+00	5.950E+01	0.	6.020E+01	4.400E+00
6.060E+01	6.700E+00	6.100E+01	8.000E+00	6.130E+01	9.700E+00
6.150E+01	1.100E+01	6.160E+01	1.380E+01	6.190E+01	1.560E+01
6.280E+01	2.050E+01	6.320E+01	2.380E+01	6.400E+01	2.800E+01
6.510E+01	3.080E+01	6.630E+01	3.590E+01	6.740E+01	4.140E+01
6.850E+01	4.600E+01	6.920E+01	4.980E+01		
3C-28 Collapsing Breaker @ 63.35		Breaker height 20.1 cm			
6.010E+01	4.000E-01	6.070E+01	3.600E+00	6.110E+01	6.300E+00
6.150E+01	1.180E+01	6.200E+01	2.040E+01	6.230E+01	2.330E+01
6.300E+01	2.410E+01	6.350E+01	2.750E+01	6.590E+01	3.520E+01
6.860E+01	4.740E+01	6.870E+01	4.880E+01	6.890E+01	4.830E+01

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
4C-1 Collapsing Breaker @ 62.0		Breaker height 15.5 cm			
5.870E+01	3.000E-01	6.010E+01	1.300E+01	6.150E+01	1.800E+01
6.270E+01	2.200E+01	6.430E+01	2.760E+01	6.550E+01	3.200E+01
6.640E+01	3.440E+01	6.780E+01	3.860E+01	6.800E+01	3.930E+01
4C-1 Surging Breaker @ 62.5		Breaker height 16.3 cm			
5.740E+01	2.000E-01	5.770E+01	2.800E+00	5.800E+01	1.400E+00
5.810E+01	1.700E+00	5.830E+01	0.	5.850E+01	2.500E+00
5.880E+01	4.300E+00	5.910E+01	4.000E-01	5.990E+01	6.800E+00
6.050E+01	7.400E+00	6.080E+01	8.600E+00	6.140E+01	6.800E+00
6.170E+01	1.300E+01	6.210E+01	1.970E+01	6.260E+01	2.200E+01
6.310E+01	2.470E+01	6.390E+01	2.660E+01	6.460E+01	2.980E+01
6.600E+01	3.450E+01	6.700E+01	3.970E+01	6.810E+01	4.350E+01
6.870E+01	4.630E+01				
4C-5 Surging Breaker @ 62.65		Breaker height 16.3 cm			
5.640E+01	2.000E-01	5.670E+01	3.200E+00	5.720E+01	3.000E+00
5.750E+01	0.	5.790E+01	1.800E+00	5.810E+01	0.
5.850E+01	0.	5.910E+01	8.000E-01	5.950E+01	1.800E+00
5.990E+01	1.500E+00	6.010E+01	3.000E+00	6.030E+01	2.000E-01
6.080E+01	6.300E+00	6.110E+01	7.800E+00	6.150E+01	1.510E+01
6.270E+01	2.150E+01	6.320E+01	2.570E+01	6.370E+01	2.780E+01
6.500E+01	3.120E+01	6.650E+01	3.780E+01	6.760E+01	4.230E+01
6.880E+01	4.770E+01	6.890E+01	4.900E+01		
4C-28 Collapsing Breaker @ 63.35		Breaker height 21 cm			
6.010E+01	7.000E-01	6.080E+01	5.500E+00	6.100E+01	6.700E+00
6.150E+01	1.260E+01	6.180E+01	1.930E+01	6.220E+01	2.280E+01
6.290E+01	2.460E+01	6.340E+01	2.730E+01	6.510E+01	3.230E+01
6.640E+01	3.830E+01	6.840E+01	4.780E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
5C-1 Collapsing Breaker @ 62.95		Breaker height 10.6 cm			
5.750E+01	2.000E-01	5.880E+01	7.500E+00	6.030E+01	1.600E+01
6.170E+01	2.130E+01	6.350E+01	2.700E+01	6.540E+01	3.280E+01
6.800E+01	4.030E+01				
5C-24 Collapsing Breaker @ 62.3		Breaker height 10.5 cm			
5.750E+01	3.000E-01	5.770E+01	2.800E+00	5.800E+01	1.600E+00
5.820E+01	4.800E+00	5.850E+01	2.200E+00	5.880E+01	5.800E+00
5.900E+01	2.200E+00	5.940E+01	6.800E+00	5.960E+01	3.000E+00
6.000E+01	6.800E+00	6.020E+01	4.300E+00	6.050E+01	7.800E+00
6.070E+01	5.800E+00	6.110E+01	1.190E+01	6.130E+01	1.000E+01
6.170E+01	1.430E+01	6.230E+01	2.500E+01	6.350E+01	2.930E+01
6.550E+01	3.600E+01	6.650E+01	4.370E+01	6.670E+01	4.020E+01
6.710E+01	3.900E+01	6.800E+01	4.080E+01		
6C-1 Collapsing Breaker @ 62.95		Breaker height 10.6 cm			
5.750E+01	2.000E-01	5.880E+01	7.500E+00	6.030E+01	1.600E+01
6.170E+01	2.130E+01	6.350E+01	2.700E+01	6.540E+01	3.280E+01
6.800E+01	4.030E+01				
6C-24 Collapsing Breaker @ 62.3		Breaker height 10.4 cm			
5.850E+01	2.000E-01	5.860E+01	1.200E+00	5.880E+01	5.000E-01
5.900E+01	2.000E+00	5.920E+01	7.000E-01	5.950E+01	3.300E+00
5.970E+01	1.400E+00	6.070E+01	8.200E+00	6.140E+01	1.300E+01
6.160E+01	1.460E+01	6.210E+01	2.400E+01	6.350E+01	2.950E+01
6.490E+01	3.380E+01	6.640E+01	4.180E+01	6.660E+01	4.340E+01
6.690E+01	4.020E+01	6.720E+01	3.910E+01		
7C-1 Collapsing Breaker @ 62.45		Breaker height 14.8 cm			
5.760E+01	2.000E-01	5.980E+01	1.180E+01	6.160E+01	2.060E+01
6.290E+01	2.660E+01	6.640E+01	3.430E+01	6.800E+01	4.070E+01
7C-26 Collapsing Breaker @ 62.8		Breaker height 18.8 cm			
5.990E+01	2.000E-01	6.020E+01	2.400E+00	6.030E+01	2.600E+00
6.040E+01	3.700E+00	6.060E+01	4.200E+00	6.070E+01	6.000E+00
6.090E+01	6.600E+00	6.100E+01	8.500E+00	6.130E+01	9.100E+00
6.140E+01	1.150E+01	6.170E+01	1.180E+01	6.240E+01	2.600E+01
6.290E+01	2.840E+01	6.500E+01	3.650E+01	6.700E+01	4.750E+01
6.710E+01	5.130E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
BC-1 Collapsing Breaker @ 62.8		Breaker height 17.6 cm			
5.910E+01	2.000E-01	6.000E+01	6.400E+00	6.110E+01	1.760E+01
6.220E+01	2.540E+01	6.400E+01	3.100E+01	6.560E+01	3.480E+01
6.800E+01	4.230E+01				
BC-26 Collapsing Breaker @ 62.8		Breaker height 16 cm			
5.970E+01	2.000E-01	6.040E+01	4.800E+00	6.090E+01	7.000E+00
6.100E+01	8.500E+00	6.130E+01	8.700E+00	6.150E+01	1.170E+01
6.170E+01	1.130E+01	6.190E+01	1.280E+01	6.250E+01	2.470E+01
6.460E+01	3.380E+01	6.600E+01	4.010E+01	6.720E+01	4.830E+01
6.730E+01	5.150E+01				
9C-1 Collapsing Breaker @ 62.9		Breaker height 11 cm			
5.550E+01	2.000E-01	5.750E+01	7.200E+00	6.100E+01	1.630E+01
6.400E+01	2.660E+01	6.600E+01	3.220E+01	6.800E+01	3.850E+01
9C-24 Collapsing Breaker @ 63.55		Breaker height 11.7 cm			
5.460E+01	2.000E-01	5.580E+01	2.000E+00	5.690E+01	3.800E+00
5.710E+01	2.700E+00	5.740E+01	4.000E+00	5.750E+01	2.500E+00
5.800E+01	4.300E+00	5.830E+01	4.000E+00	5.850E+01	4.900E+00
5.900E+01	5.200E+00	5.920E+01	6.600E+00	5.940E+01	4.800E+00
5.960E+01	7.800E+00	5.980E+01	7.100E+00	6.000E+01	9.000E+00
6.030E+01	6.000E+00	6.060E+01	9.100E+00	6.070E+01	7.600E+00
6.100E+01	9.300E+00	6.130E+01	6.800E+00	6.150E+01	1.010E+01
6.170E+01	8.400E+00	6.200E+01	1.160E+01	6.220E+01	9.600E+00
6.250E+01	1.380E+01	6.270E+01	1.250E+01	6.340E+01	2.370E+01
6.350E+01	2.400E+01	6.410E+01	2.800E+01	6.510E+01	3.120E+01
6.620E+01	3.590E+01	6.710E+01	4.020E+01	6.720E+01	4.150E+01
6.760E+01	3.870E+01	6.800E+01	3.880E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
10C-1 Collapsing Breaker @ 62.9		Breaker height 11.2 cm			
5.650E+01	2.000E-01	5.800E+01	6.900E+00	6.000E+01	1.330E+01
6.180E+01	1.920E+01	6.340E+01	2.520E+01	6.550E+01	3.010E+01
6.800E+01	3.810E+01				
10C-24 Collapsing Breaker @ 62.85		Breaker height 11.3 cm			
5.600E+01	2.000E-01	5.800E+01	5.000E+00	5.820E+01	3.500E+00
5.850E+01	5.700E+00	5.860E+01	4.100E+00	5.900E+01	6.600E+00
5.920E+01	4.000E+00	5.960E+01	6.000E+00	6.000E+01	6.200E+00
6.110E+01	1.030E+01	6.180E+01	1.380E+01	6.200E+01	1.280E+01
6.260E+01	2.200E+01	6.290E+01	2.380E+01	6.350E+01	2.770E+01
6.400E+01	2.960E+01	6.520E+01	3.210E+01	6.630E+01	3.630E+01
6.720E+01	4.090E+01	6.730E+01	4.210E+01	6.760E+01	3.940E+01
6.800E+01	3.990E+01				
11C-1 Collapsing Breaker @ 62.85		Breaker height 11.6 cm			
5.670E+01	2.000E-01	5.790E+01	5.900E+00	5.910E+01	1.150E+01
6.000E+01	1.550E+01	6.180E+01	2.040E+01	6.360E+01	2.640E+01
6.510E+01	3.080E+01	6.650E+01	3.440E+01	6.800E+01	3.900E+01
11C-5 Collapsing Breaker @ 62.9		Breaker height 12.8 cm			
5.890E+01	2.000E-01	5.930E+01	1.900E+00	5.940E+01	2.000E-01
5.980E+01	5.100E+00	6.050E+01	6.700E+00	6.070E+01	6.400E+00
6.090E+01	8.800E+00	6.110E+01	7.000E+00	6.150E+01	1.230E+01
6.170E+01	1.050E+01	6.220E+01	1.790E+01	6.260E+01	2.570E+01
6.310E+01	2.640E+01	6.360E+01	3.030E+01	6.490E+01	3.500E+01
6.570E+01	3.910E+01	6.680E+01	4.530E+01	6.700E+01	4.820E+01
6.720E+01	4.920E+01	6.800E+01	4.260E+01		
11C-24 Collapsing Breaker @ 61.8		Breaker height 10.4 cm			
5.960E+01	2.000E-01	6.030E+01	4.100E+00	6.080E+01	7.700E+00
6.100E+01	1.000E+01	6.130E+01	1.030E+01	6.160E+01	1.750E+01
6.190E+01	2.160E+01	6.240E+01	2.480E+01	6.320E+01	2.820E+01
6.520E+01	3.590E+01	6.680E+01	4.530E+01	6.700E+01	4.880E+01
6.720E+01	4.880E+01	6.800E+01	4.280E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
12C-1					
5.720E+01	2.000E-01	5.790E+01	5.800E+00	5.940E+01	1.230E+01
6.060E+01	1.710E+01	6.230E+01	2.160E+01	6.350E+01	2.600E+01
6.510E+01	3.080E+01	6.610E+01	3.470E+01	6.800E+01	3.930E+01
12C-5 Collapsing Breaker @ 62.9		Breaker height 15 cm			
5.920E+01	2.000E-01	5.940E+01	2.300E+00	5.970E+01	2.000E-01
6.000E+01	4.900E+00	6.020E+01	5.300E+00	6.040E+01	8.200E+00
6.060E+01	8.300E+00	6.100E+01	1.200E+01	6.130E+01	1.080E+01
6.170E+01	1.510E+01	6.210E+01	2.520E+01	6.300E+01	2.860E+01
6.330E+01	3.080E+01	6.480E+01	3.540E+01	6.590E+01	4.100E+01
6.680E+01	4.690E+01	6.690E+01	4.940E+01	6.800E+01	4.300E+01
12C-24 Collapsing Breaker @ 61.9		Breaker height 11.4 cm			
5.950E+01	2.000E-01	6.020E+01	5.200E+00	6.060E+01	8.800E+00
6.100E+01	1.050E+01	6.130E+01	1.680E+01	6.160E+01	2.170E+01
6.210E+01	2.480E+01	6.270E+01	2.810E+01	6.420E+01	3.260E+01
6.550E+01	3.840E+01	6.670E+01	4.460E+01	6.690E+01	4.920E+01
6.800E+01	4.300E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
13C-1 Collapsing Breaker @ 63.35		Breaker height 8.5 cm			
5.580E+01	2.000E-01	5.810E+01	6.000E+00	6.110E+01	1.600E+01
6.350E+01	2.550E+01	6.550E+01	3.040E+01	6.800E+01	3.840E+01
13C-1 Collapsing Breaker @ 62.95		Breaker height 8.5 cm			
5.570E+01	2.000E-01	5.800E+01	4.900E+00	6.000E+01	9.200E+00
6.100E+01	1.060E+01	6.210E+01	1.340E+01	6.220E+01	1.600E+01
6.260E+01	1.780E+01	6.270E+01	2.300E+01	6.280E+01	2.460E+01
6.310E+01	2.520E+01	6.360E+01	2.850E+01	6.490E+01	3.330E+01
6.590E+01	3.860E+01	6.620E+01	4.050E+01	6.710E+01	3.640E+01
6.800E+01	3.830E+01				
13C-5 Collapsing Breaker @ 62.4		Breaker height 8.2 cm			
5.580E+01	2.000E-01	5.790E+01	4.700E+00	5.870E+01	4.300E+00
5.980E+01	3.200E+00	6.080E+01	7.200E+00	6.150E+01	1.170E+01
6.190E+01	1.580E+01	6.230E+01	2.360E+01	6.320E+01	2.830E+01
6.430E+01	3.140E+01	6.510E+01	3.450E+01	6.580E+01	3.900E+01
6.620E+01	4.000E+01	6.710E+01	3.610E+01	6.800E+01	3.820E+01
13C-24 Collapsing Breaker @ 62.25		Breaker height 8.1 cm			
5.580E+01	2.000E-01	5.670E+01	2.200E+00	5.750E+01	1.700E+00
5.820E+01	3.000E-01	5.850E+01	0.	5.970E+01	2.100E+00
6.060E+01	6.800E+00	6.130E+01	1.180E+01	6.160E+01	1.500E+01
6.210E+01	2.240E+01	6.260E+01	2.660E+01	6.330E+01	2.930E+01
6.440E+01	3.320E+01	6.540E+01	3.820E+01	6.550E+01	4.070E+01
6.570E+01	3.920E+01	6.620E+01	4.030E+01	6.710E+01	3.610E+01
6.800E+01	3.850E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
14C-1 Collapsing Breaker @ 63.35		Breaker height 8.5 cm			
5.580E+01	2.000E-01	5.810E+01	6.000E+00	6.110E+01	1.600E+01
6.350E+01	2.550E+01	6.550E+01	3.040E+01	6.800E+01	3.840E+01
14C-1 Collapsing Breaker @ 62.8		Breaker height 8.5 cm			
5.570E+01	2.000E-01	5.770E+01	5.700E+00	5.870E+01	8.000E+00
6.130E+01	1.220E+01	6.200E+01	1.450E+01	6.210E+01	1.580E+01
6.250E+01	1.820E+01	6.260E+01	2.250E+01	6.270E+01	2.500E+01
6.290E+01	2.520E+01	6.350E+01	2.850E+01	6.430E+01	3.120E+01
6.570E+01	3.800E+01	6.580E+01	3.970E+01	6.610E+01	4.000E+01
6.720E+01	3.600E+01	6.800E+01	3.800E+01		
14C-5 Collapsing Breaker @ 62.4		Breaker height 8.5 cm			
5.580E+01	2.000E-01	5.760E+01	5.000E+00	5.910E+01	3.700E+00
6.010E+01	5.700E+00	6.080E+01	8.400E+00	6.160E+01	1.310E+01
6.190E+01	1.670E+01	6.230E+01	2.440E+01	6.340E+01	2.930E+01
6.440E+01	3.280E+01	6.530E+01	3.840E+01	6.540E+01	4.050E+01
6.610E+01	4.000E+01	6.720E+01	3.790E+01	6.800E+01	3.780E+01
14C-24 Collapsing Breaker @ 62.25		Breaker height 8.5 cm			
5.560E+01	2.000E-01	5.650E+01	2.100E+00	5.750E+01	5.000E-01
5.820E+01	0.	5.900E+01	1.200E+00	5.990E+01	4.000E+00
6.070E+01	7.700E+00	6.120E+01	1.190E+01	6.150E+01	1.600E+01
6.190E+01	2.260E+01	6.240E+01	2.610E+01	6.280E+01	2.880E+01
6.380E+01	3.210E+01	6.450E+01	3.620E+01	6.490E+01	4.010E+01
6.500E+01	4.220E+01	6.520E+01	4.150E+01	6.530E+01	3.960E+01
6.570E+01	3.920E+01	6.610E+01	4.000E+01	6.720E+01	3.590E+01
6.800E+01	3.780E+01				

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
150-1 Collapsing Breaker @ 63.7		Breaker height 7.5 cm			
5.670E+01	2.000E-01	5.840E+01	8.500E+00	6.060E+01	1.620E+01
6.230E+01	2.070E+01	6.380E+01	2.630E+01	6.560E+01	3.180E+01
6.800E+01	3.830E+01				
150-1 Collapsing Breaker @ 63.85		Breaker height 8.3 cm			
5.660E+01	2.000E-01	5.820E+01	7.000E+00	5.920E+01	1.020E+01
5.960E+01	1.100E+01	6.050E+01	9.200E+00	6.090E+01	8.800E+00
6.160E+01	1.220E+01	6.230E+01	1.550E+01	6.250E+01	1.320E+01
6.320E+01	2.600E+01	6.430E+01	2.950E+01	6.560E+01	3.350E+01
6.670E+01	3.800E+01	6.750E+01	4.210E+01	6.770E+01	4.380E+01
6.780E+01	4.600E+01	6.800E+01	4.570E+01		
150-5 Collapsing Breaker @ 62.95		Breaker height 7.5 cm			
5.650E+01	2.000E-01	5.770E+01	6.300E+00	5.880E+01	8.800E+00
6.010E+01	4.600E+00	6.050E+01	8.600E+00	6.110E+01	6.500E+00
6.150E+01	8.700E+00	6.180E+01	1.100E+01	6.190E+01	1.130E+01
6.260E+01	2.450E+01	6.380E+01	2.880E+01	6.530E+01	3.330E+01
6.620E+01	3.680E+01	6.670E+01	3.950E+01	6.700E+01	4.160E+01
6.720E+01	4.400E+01	6.760E+01	4.430E+01	6.800E+01	4.550E+01
150-24 Collapsing Breaker @ 63.0		Breaker height 7.9 cm			
5.640E+01	2.000E-01	5.780E+01	5.200E+00	5.950E+01	3.800E+00
6.020E+01	2.600E+00	6.090E+01	4.200E+00	6.130E+01	7.300E+00
6.180E+01	1.080E+01	6.190E+01	1.210E+01	6.200E+01	1.160E+01
6.280E+01	2.640E+01	6.450E+01	3.200E+01	6.590E+01	3.700E+01
6.680E+01	4.200E+01	6.700E+01	4.410E+01	6.700E+01	4.570E+01
6.730E+01	4.570E+01	6.800E+01	4.520E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
160-1 Collapsing Breaker @ 63.7		Breaker height 7.6 cm			
5.620E+01	2.000E-01	5.790E+01	6.800E+00	5.980E+01	1.400E+01
6.150E+01	1.970E+01	6.340E+01	2.550E+01	6.560E+01	3.080E+01
6.800E+01	3.800E+01				
160-1 Collapsing Breaker @ 63.85		Breaker height 9 cm			
5.620E+01	2.000E-01	5.800E+01	6.800E+00	5.910E+01	1.040E+01
6.010E+01	6.300E+00	6.050E+01	6.700E+00	6.130E+01	1.060E+01
6.180E+01	1.310E+01	6.200E+01	1.160E+01	6.270E+01	2.510E+01
6.390E+01	2.960E+01	6.520E+01	3.330E+01	6.620E+01	3.740E+01
6.720E+01	4.370E+01	6.720E+01	4.720E+01	6.770E+01	4.680E+01
6.800E+01	4.220E+01				
160-5 Collapsing Breaker @ 62.95		Breaker height 7.7 cm			
5.620E+01	2.000E-01	5.840E+01	8.300E+00	5.920E+01	3.700E+00
5.970E+01	3.300E+00	6.040E+01	4.800E+00	6.120E+01	8.900E+00
6.140E+01	1.070E+01	6.160E+01	9.900E+00	6.220E+01	2.320E+01
6.350E+01	2.880E+01	6.490E+01	3.250E+01	6.590E+01	3.730E+01
6.650E+01	4.260E+01	6.660E+01	4.550E+01	6.700E+01	4.520E+01
6.720E+01	4.330E+01	6.730E+01	4.720E+01	6.770E+01	4.690E+01
6.800E+01	4.230E+01				
160-24 Collapsing Breaker @ 62.35		Breaker height 7.8 cm			
5.620E+01	2.000E-01	5.830E+01	7.700E+00	5.920E+01	3.300E+00
5.980E+01	3.200E+00	6.070E+01	5.500E+00	6.090E+01	7.200E+00
6.110E+01	8.500E+00	6.150E+01	1.070E+01	6.230E+01	2.650E+01
6.380E+01	3.180E+01	6.510E+01	3.570E+01	6.640E+01	4.330E+01
6.640E+01	4.470E+01	6.650E+01	4.860E+01	6.680E+01	4.740E+01
6.680E+01	4.560E+01	6.800E+01	4.400E+01		

X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
17C-1 Collapsing Breaker @ 61.9		Breaker height 6.1 cm			
5.570E+01	2.000E-01	5.740E+01	7.600E+00	5.900E+01	1.110E+01
6.050E+01	1.530E+01	6.260E+01	2.220E+01	6.460E+01	2.880E+01
6.610E+01	3.370E+01	6.800E+01	3.820E+01		
17C-1 Collapsing Breaker @ 61.9		Breaker height 7 cm			
5.560E+01	2.000E-01	5.690E+01	2.900E+00	5.710E+01	3.400E+00
5.780E+01	4.800E+00	5.850E+01	6.300E+00	5.890E+01	5.400E+00
5.940E+01	5.900E+00	6.010E+01	8.200E+00	6.030E+01	8.400E+00
6.080E+01	1.790E+01	6.150E+01	2.080E+01	6.330E+01	2.550E+01
6.410E+01	2.950E+01	6.440E+01	3.320E+01	6.480E+01	3.060E+01
6.550E+01	3.110E+01	6.680E+01	3.530E+01	6.800E+01	3.870E+01
17C-5 Collapsing Breaker @ 60.95		Breaker height 5.9 cm			
5.560E+01	2.000E-01	5.700E+01	3.000E+00	5.820E+01	5.900E+00
5.880E+01	3.400E+00	5.930E+01	3.700E+00	5.990E+01	5.000E+00
6.040E+01	7.700E+00	6.060E+01	1.420E+01	6.100E+01	1.960E+01
6.240E+01	2.330E+01	6.340E+01	2.600E+01	6.420E+01	2.930E+01
6.460E+01	3.250E+01	6.470E+01	3.350E+01	6.500E+01	3.090E+01
6.550E+01	3.130E+01	6.640E+01	3.380E+01	6.730E+01	3.680E+01
6.800E+01	3.880E+01				
17C-24 Collapsing Breaker @ 61.2		Breaker height 6.6 cm			
5.670E+01	2.000E-01	5.680E+01	2.400E+00	5.780E+01	4.600E+00
5.800E+01	5.400E+00	5.860E+01	1.700E+00	5.910E+01	9.000E-01
5.950E+01	1.500E+00	5.990E+01	3.400E+00	6.030E+01	6.300E+00
6.070E+01	1.480E+01	6.100E+01	2.060E+01	6.230E+01	2.410E+01
6.310E+01	2.590E+01	6.390E+01	2.870E+01	6.440E+01	3.260E+01
6.450E+01	3.400E+01	6.470E+01	3.420E+01	6.500E+01	3.100E+01
6.550E+01	3.120E+01	6.700E+01	3.580E+01	6.800E+01	3.870E+01

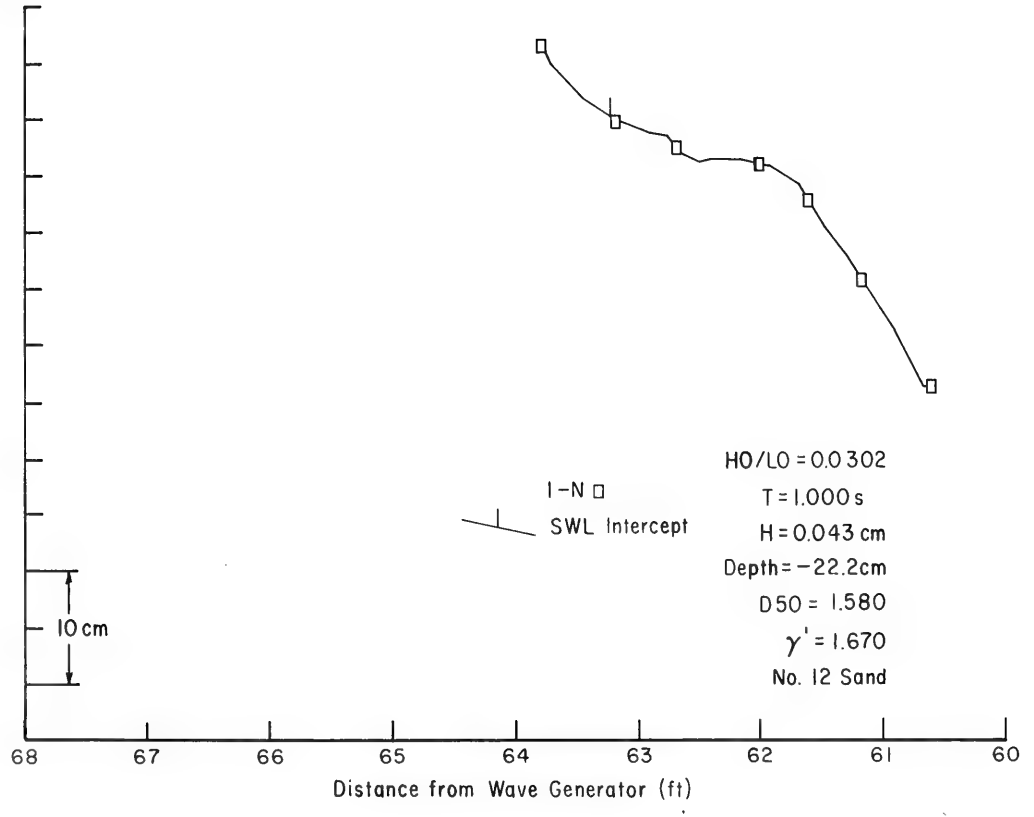
X(FT)	Y(CM)	X(FT)	Y(CM)	X(FT)	Y(CM)
18C-7 Collapsing Breaker @ 61.9		Breaker height 6.1 cm			
5.570E+01	2.000E-01	5.740E+01	7.600E+00	5.900E+01	1.110E+01
6.050E+01	1.530E+01	6.260E+01	2.220E+01	6.460E+01	2.880E+01
6.610E+01	3.370E+01	6.800E+01	3.820E+01		
18C-1 Collapsing Breaker @ 61.8		Breaker height 5.4 cm			
5.570E+01	2.000E-01	5.680E+01	4.900E+00	5.790E+01	7.700E+00
5.860E+01	9.200E+00	5.920E+01	7.500E+00	5.980E+01	7.300E+00
6.040E+01	8.300E+00	6.060E+01	9.100E+00	6.090E+01	1.390E+01
6.110E+01	8.800E+00	6.230E+01	2.220E+01	6.330E+01	2.460E+01
6.420E+01	2.740E+01	6.490E+01	3.070E+01	6.510E+01	3.210E+01
6.520E+01	3.310E+01	6.540E+01	3.170E+01	6.660E+01	3.480E+01
6.800E+01	3.830E+01				
18C-5 Collapsing Breaker @ 61.1		Breaker height 6 cm			
5.570E+01	2.000E-01	5.650E+01	3.600E+00	5.730E+01	6.300E+00
5.820E+01	8.400E+00	5.880E+01	5.200E+00	5.930E+01	5.000E+00
6.000E+01	6.400E+00	6.040E+01	7.400E+00	6.080E+01	1.420E+01
6.110E+01	1.930E+01	6.230E+01	2.260E+01	6.340E+01	2.560E+01
6.420E+01	2.930E+01	6.470E+01	3.270E+01	6.470E+01	3.430E+01
6.520E+01	3.390E+01	6.580E+01	3.300E+01	6.800E+01	3.850E+01
18C-24 Collapsing Breaker @ 61.2		Breaker height 6.3 cm			
5.570E+01	2.000E-01	5.670E+01	4.000E+00	5.740E+01	6.500E+00
5.790E+01	7.400E+00	5.810E+01	5.700E+00	5.840E+01	2.700E+00
5.880E+01	1.500E+00	5.920E+01	2.300E+00	5.970E+01	3.500E+00
6.020E+01	6.800E+00	6.040E+01	7.300E+00	6.070E+01	1.340E+01
6.110E+01	2.000E+01	6.190E+01	2.230E+01	6.270E+01	2.440E+01
6.350E+01	2.880E+01	6.410E+01	3.050E+01	6.450E+01	3.400E+01
6.450E+01	3.500E+01	6.520E+01	3.400E+01	6.540E+01	3.220E+01
6.690E+01	3.570E+01	6.800E+01	3.840E+01		

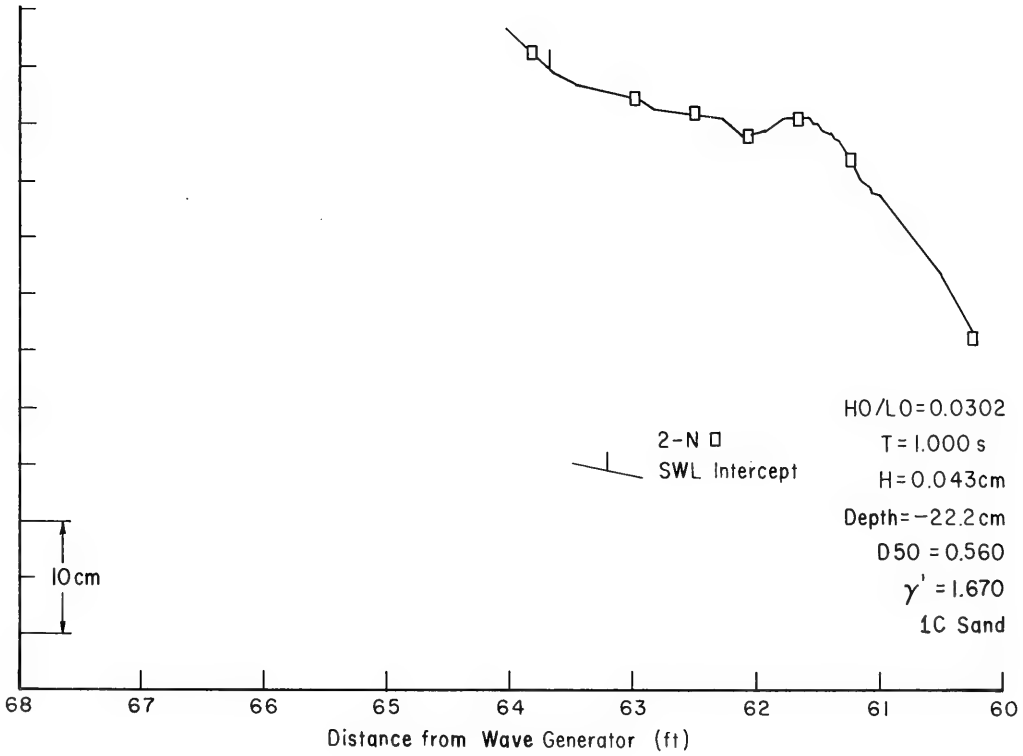
APPENDIX C

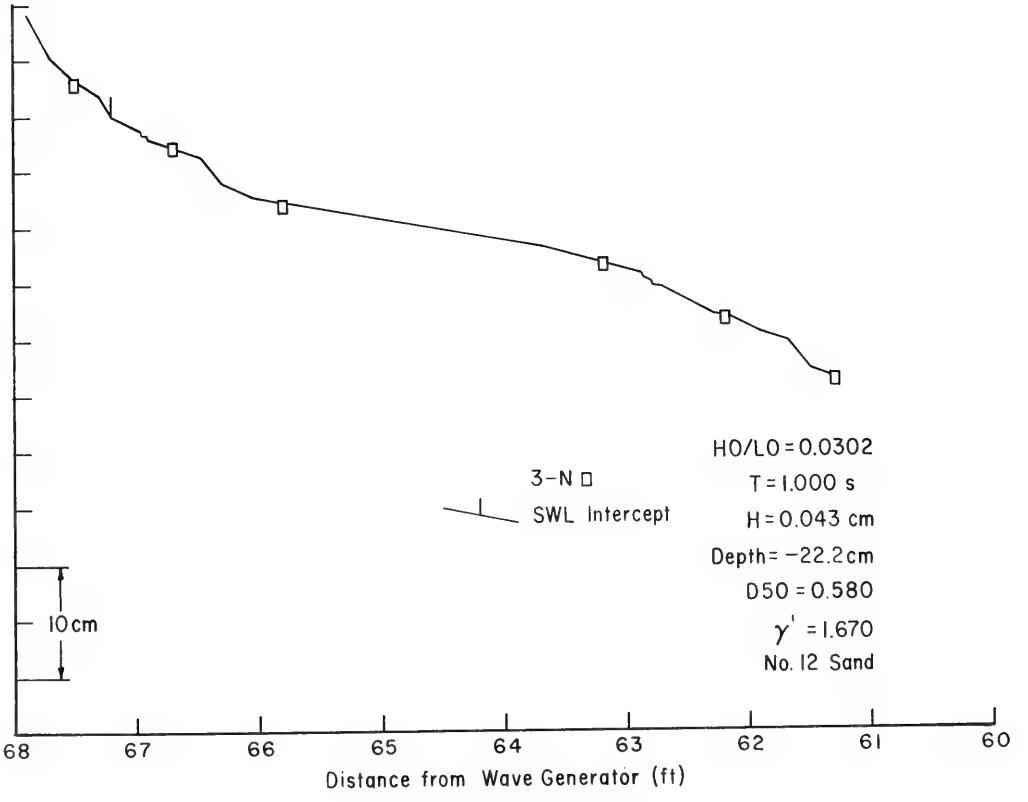
GRAPHS OF TEST RESULTS

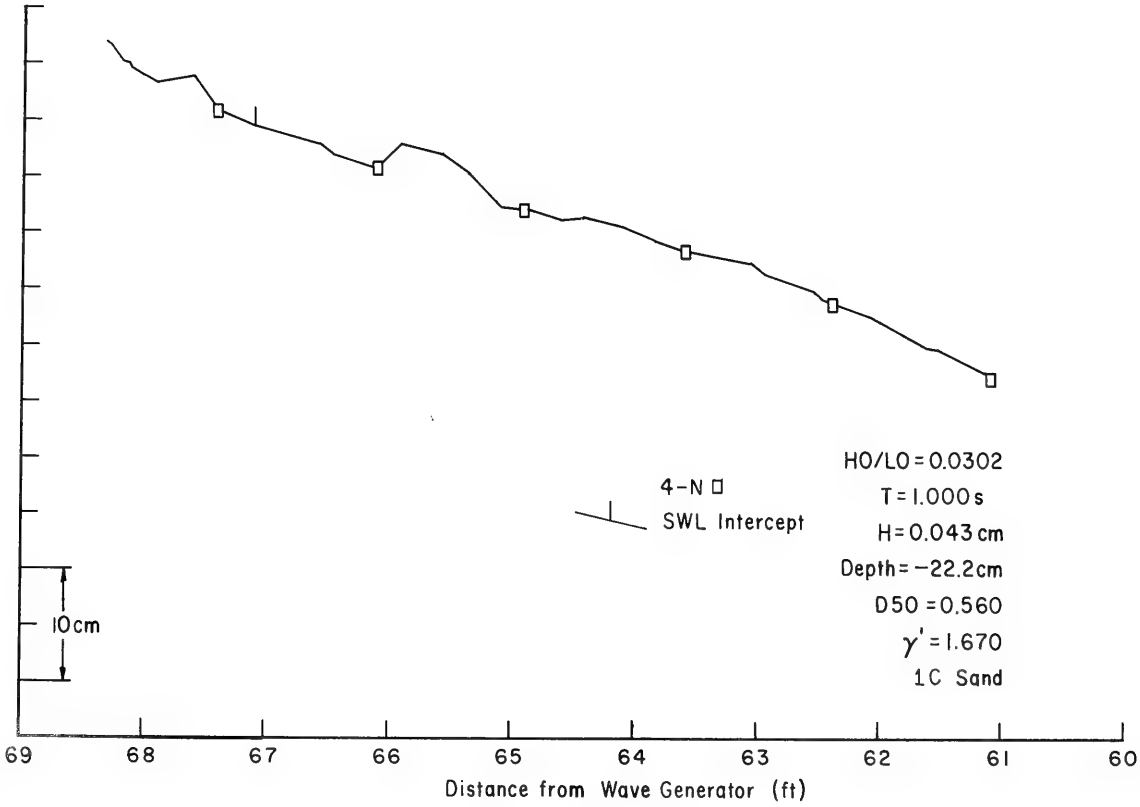
The figures in Appendix C are plots of all beach profiles. Multiple-time sequences are shifted vertically for separation purposes. The SWL intercept is the reference datum. .

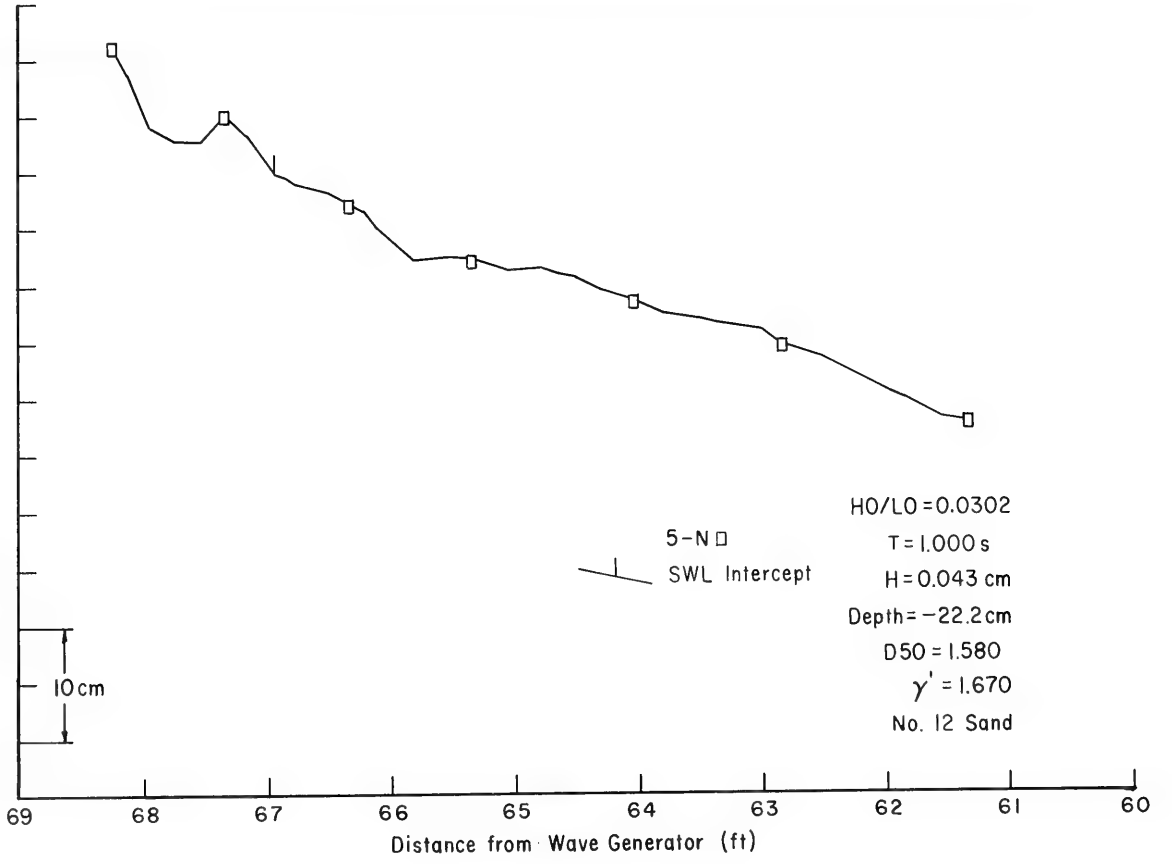
The "raw" observed data are given in tabular form in Appendix B.

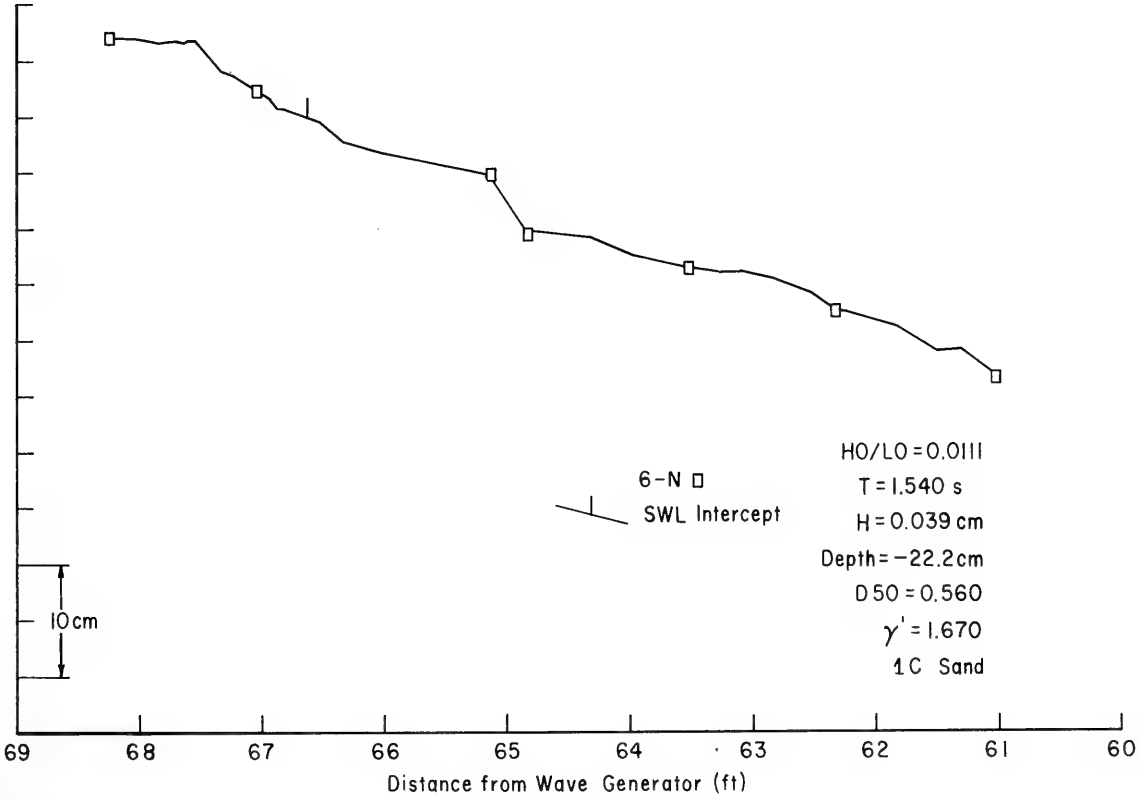

I-N □
SWL Intercept
H0/L0 = 0.0302
T = 1.000 s
H = 0.043 cm
Depth = −22.2cm
D50 = 1.580
γ' = 1.670
No. 12 Sand
10 cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

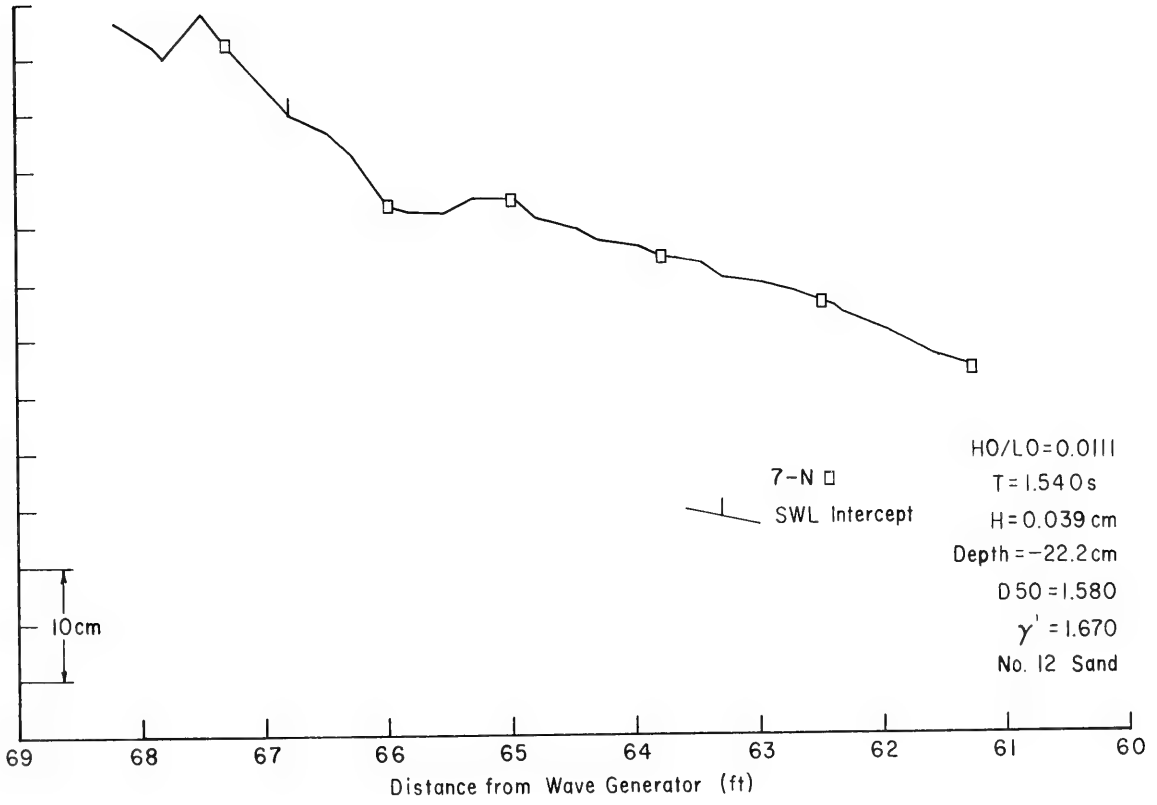

10cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)
2-N □
SWL Intercept
H0/L0=0.0302
T=1.000 s
H=0.043cm
Depth=−22.2cm
D50 =0.560
γ' =1.670
1C Sand

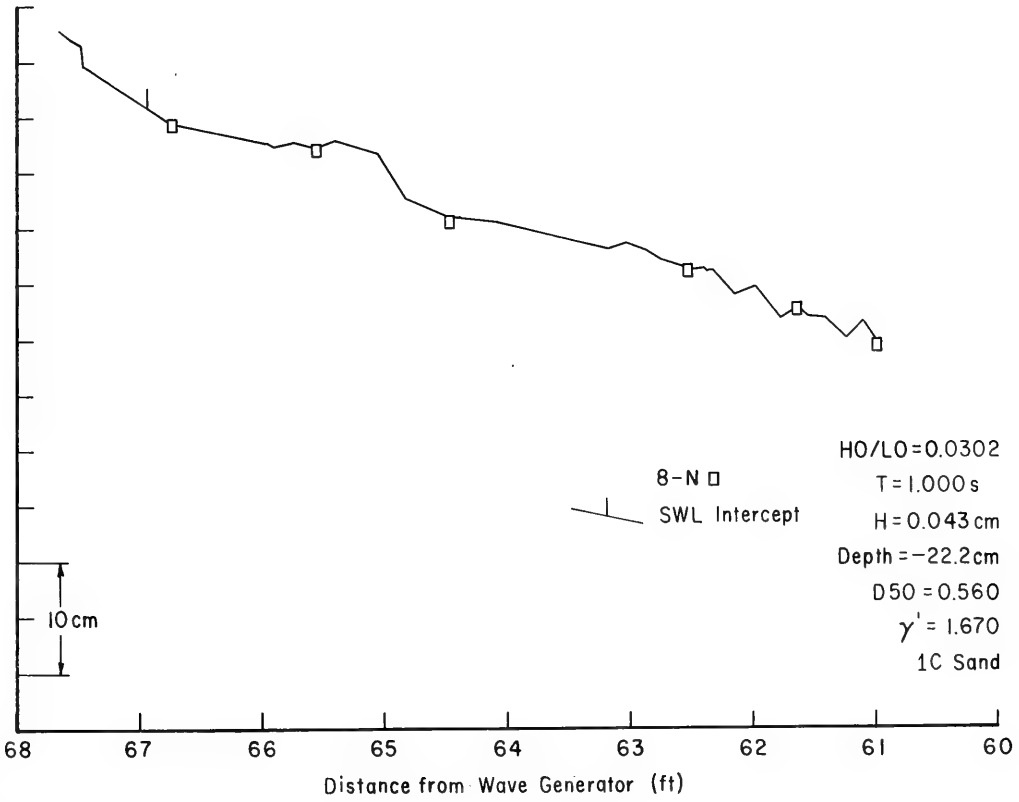

3-N □
SWL Intercept
H0/L0 = 0.0302
T = 1.000 s
H = 0.043 cm
Depth = −22.2 cm
D50 = 0.580
γ' = 1.670
No. 12 Sand
10 cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

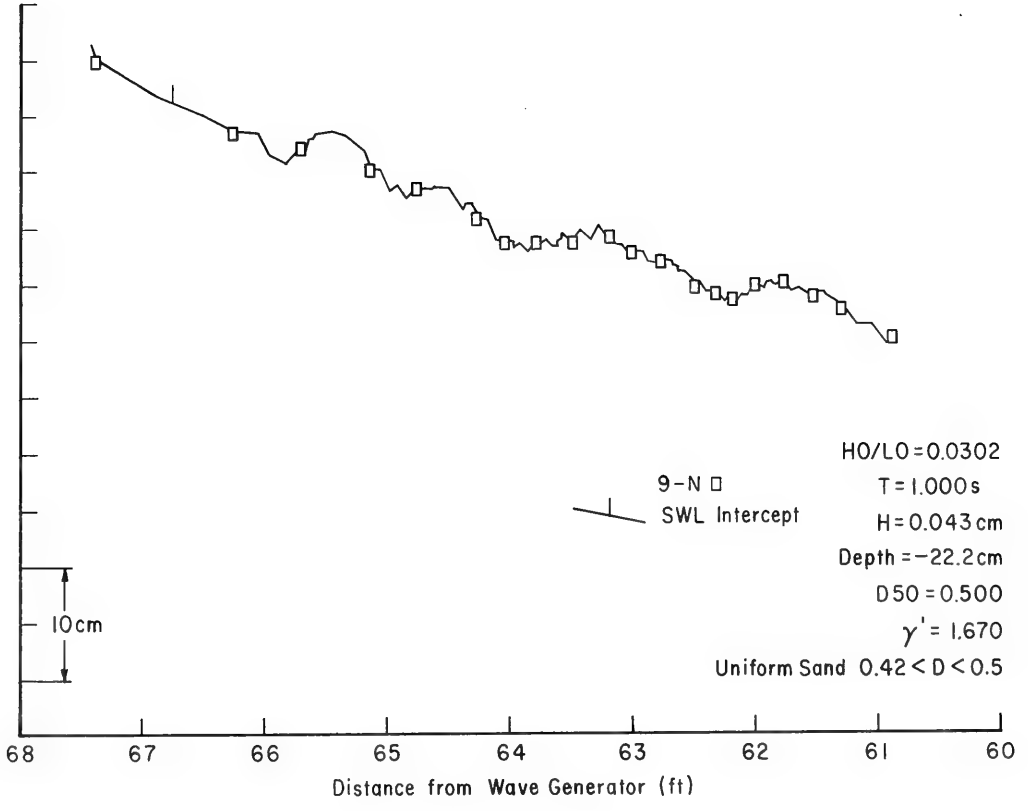

4-N □
SWL Intercept
HO/LO = 0.0302
T = 1.000 s
H = 0.043 cm
Depth = −22.2 cm
D50 = 0.560
γ' = 1.670
1C Sand
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

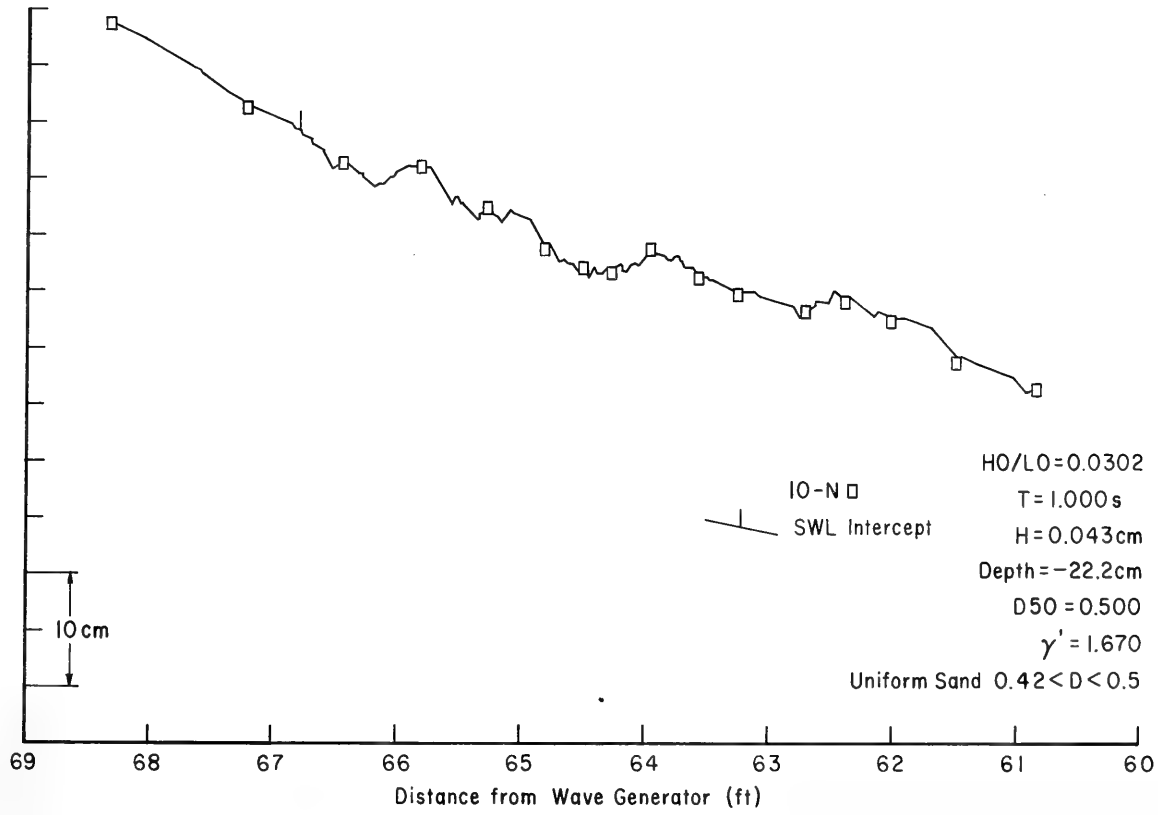

H0/L0 = 0.0302
T = 1.000 s
H = 0.043 cm
Depth = −22.2 cm
D50 = 1.580
γ' = 1.670
No. 12 Sand
5-N□
SWL Intercept
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

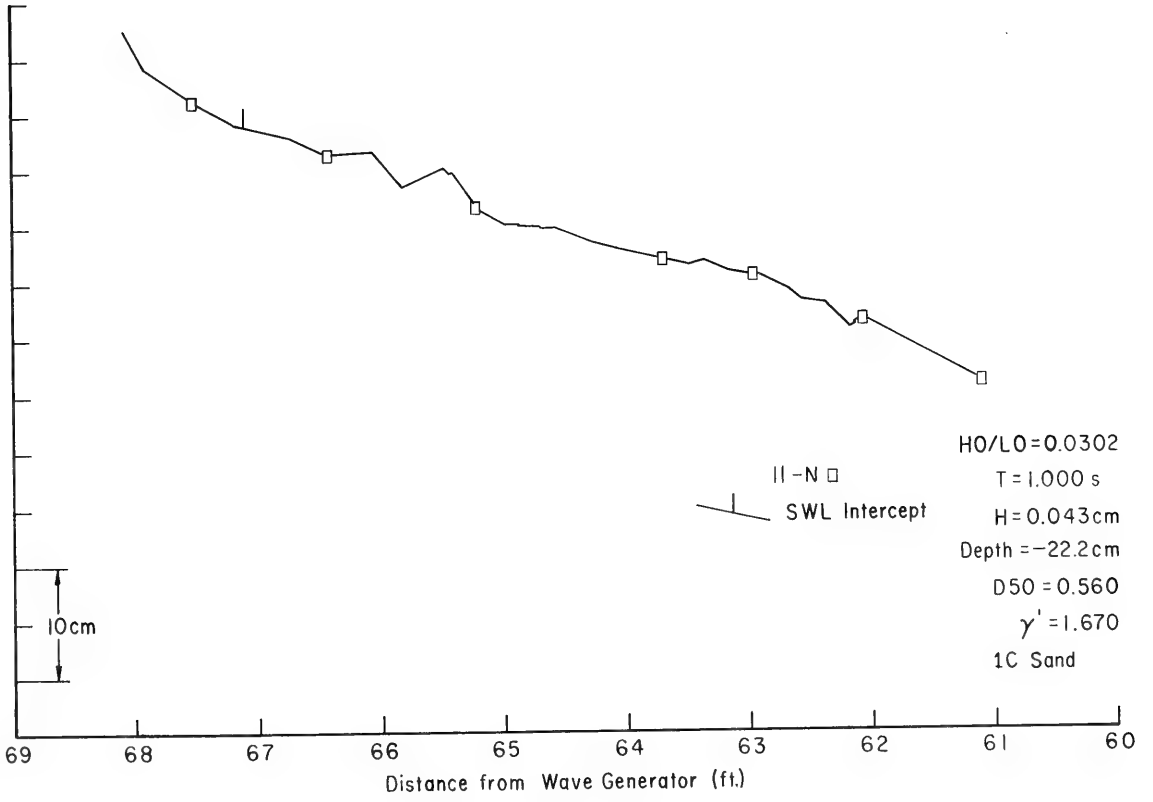

6-N □
SWL Intercept
HO/LO = 0.0111
T = 1.540 s
H = 0.039 cm
Depth = −22.2cm
D50 = 0.560
γ' = 1.670
1C Sand
10cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

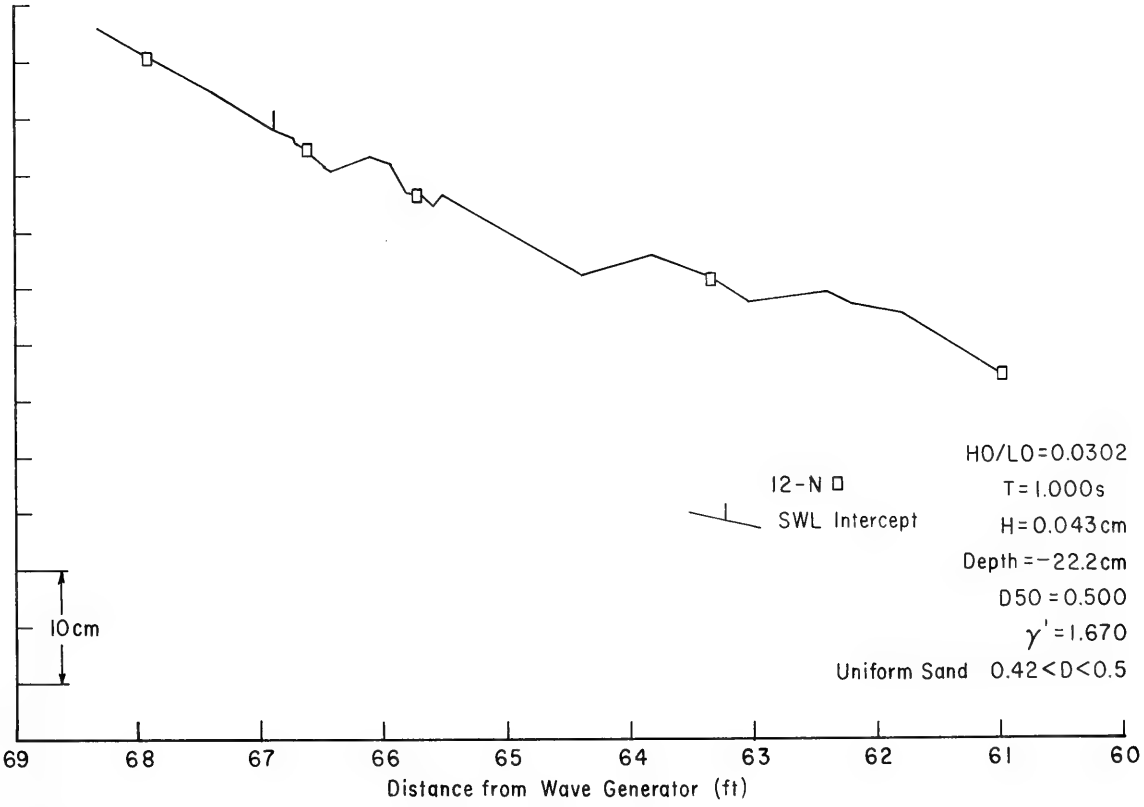

7-N □
SWL Intercept
H0/L0=0.0111
T=1.540s
H=0.039cm
Depth=−22.2cm
D50=1.580
γ' =1.670
No. 12 Sand
10cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

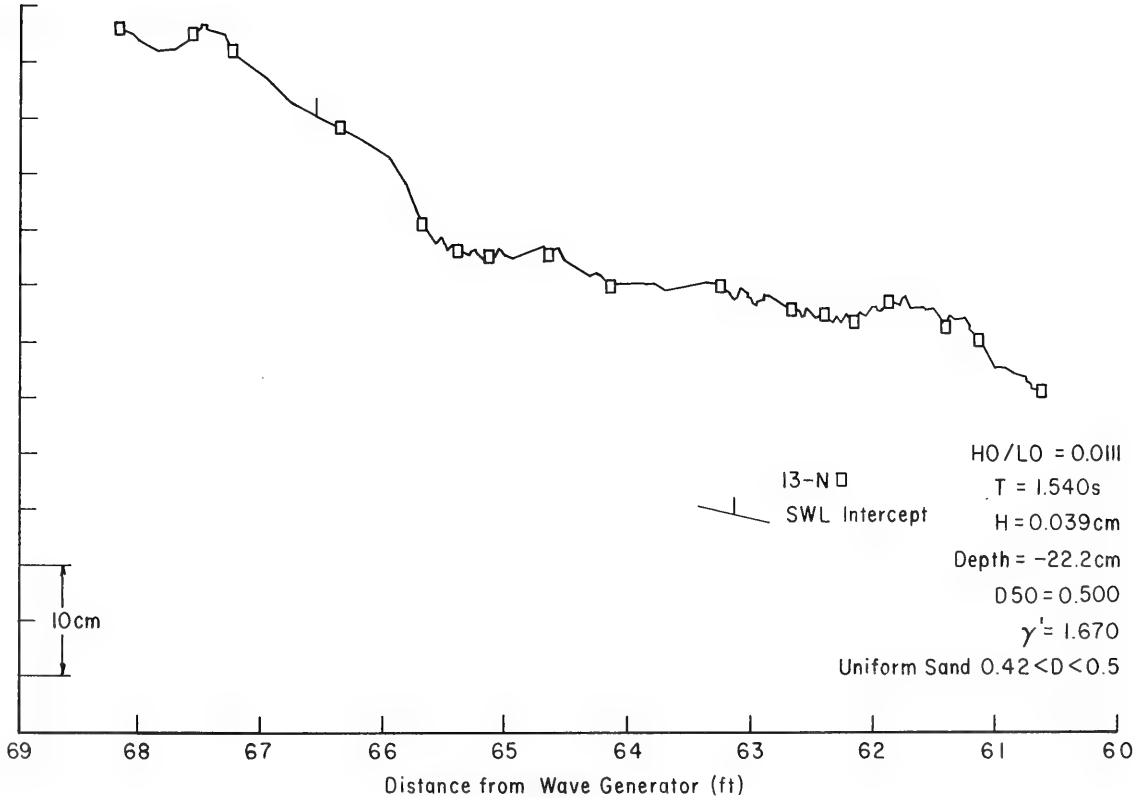

8-N □
SWL Intercept
H0/L0=0.0302
T=1.000 s
H=0.043 cm
Depth=−22.2cm
D50=0.560
γ' = 1.670
1C Sand
10 cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

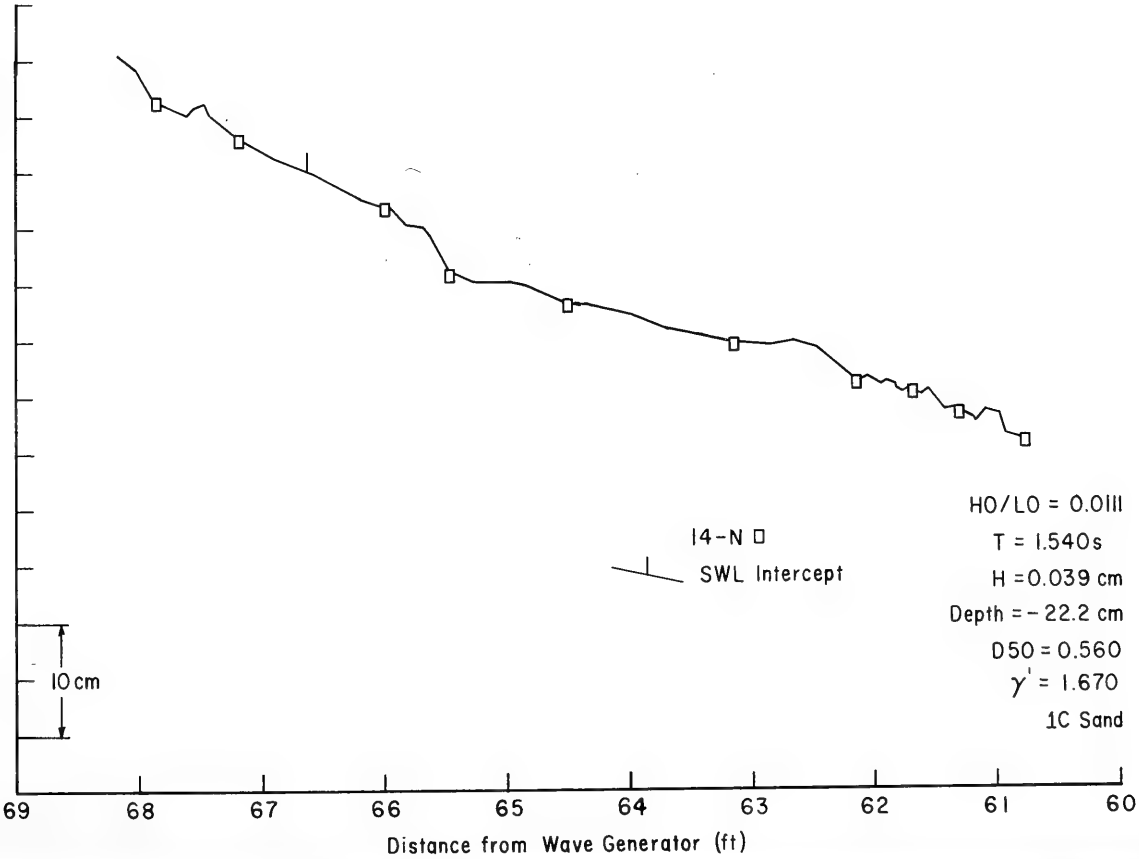

HO/LO=0.0302
T=1.000s
H=0.043cm
Depth=−22.2cm
D50=0.500
γ'=1.670
Uniform Sand 0.42<D<0.5
9-N □
SWL Intercept
10cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

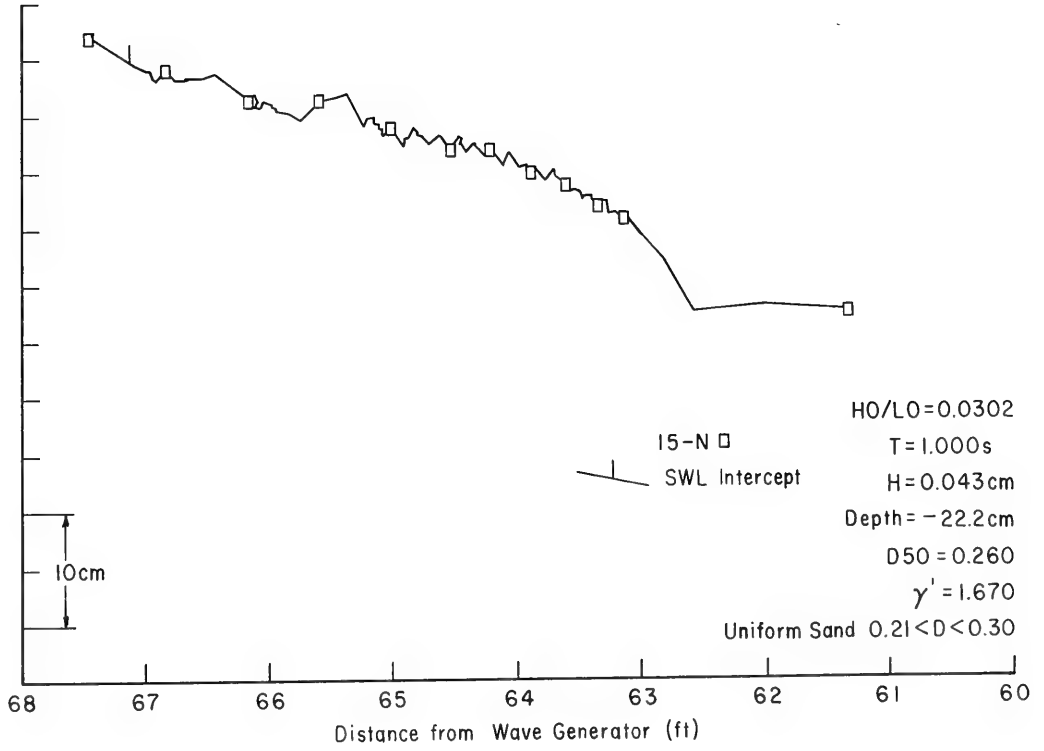

10-N
SWL Intercept
H0/L0=0.0302
T=1.000s
H=0.043cm
Depth=−22.2cm
D50=0.500
γ'=1.670
Uniform Sand 0.42<D<0.5
10cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

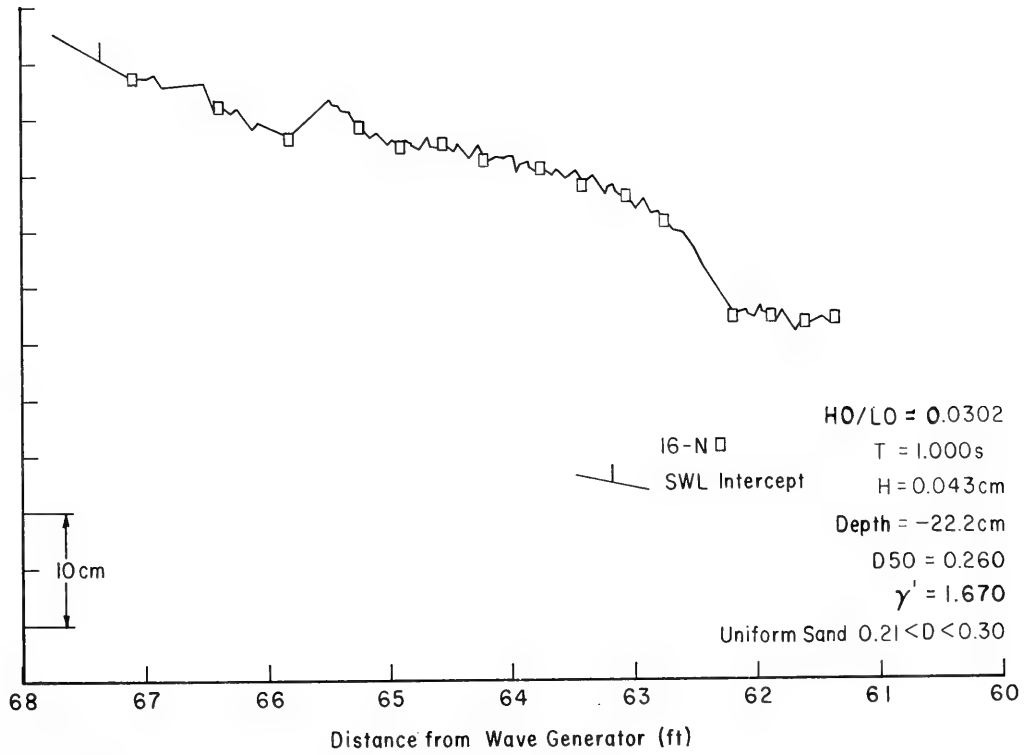

H0/L0=0.0302
T=1.000 s
H=0.043cm
Depth=−22.2cm
D50=0.560
γ'=1.670
1C Sand
II-N □
SWL Intercept
10cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft.)

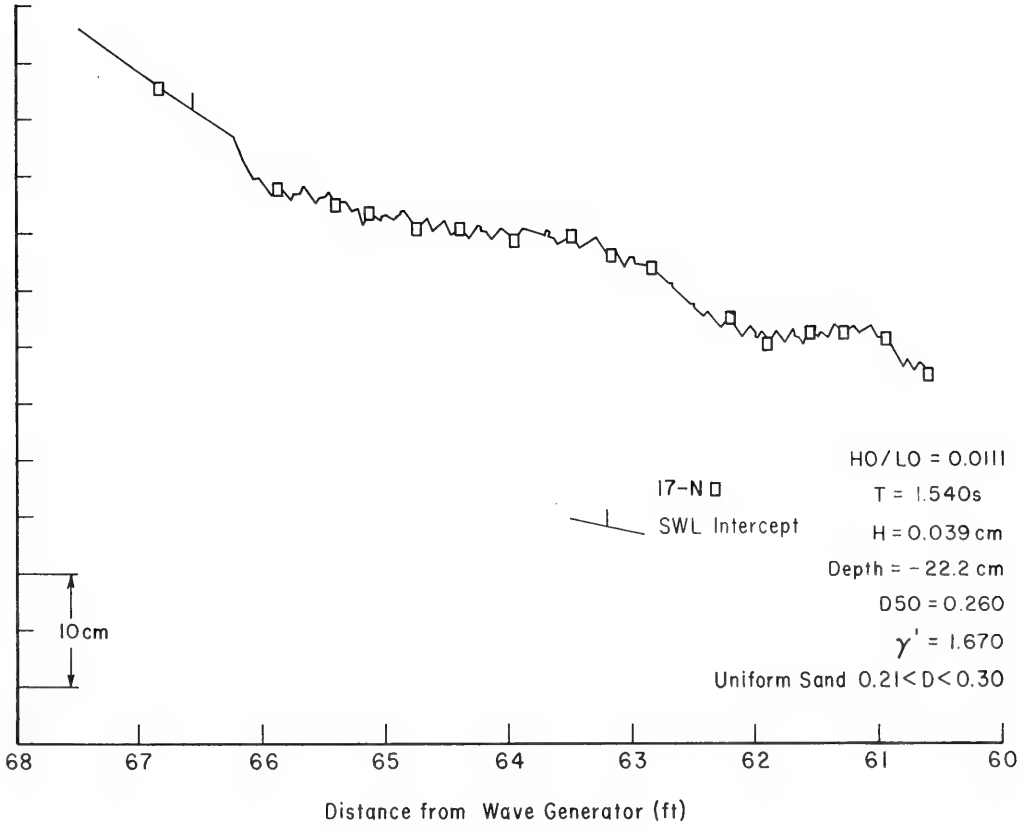

12-N □
SWL Intercept
H0/L0=0.0302
T=1.000s
H=0.043cm
Depth=−22.2cm
D50=0.500
γ'=1.670
Uniform Sand 0.42<D<0.5
10cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

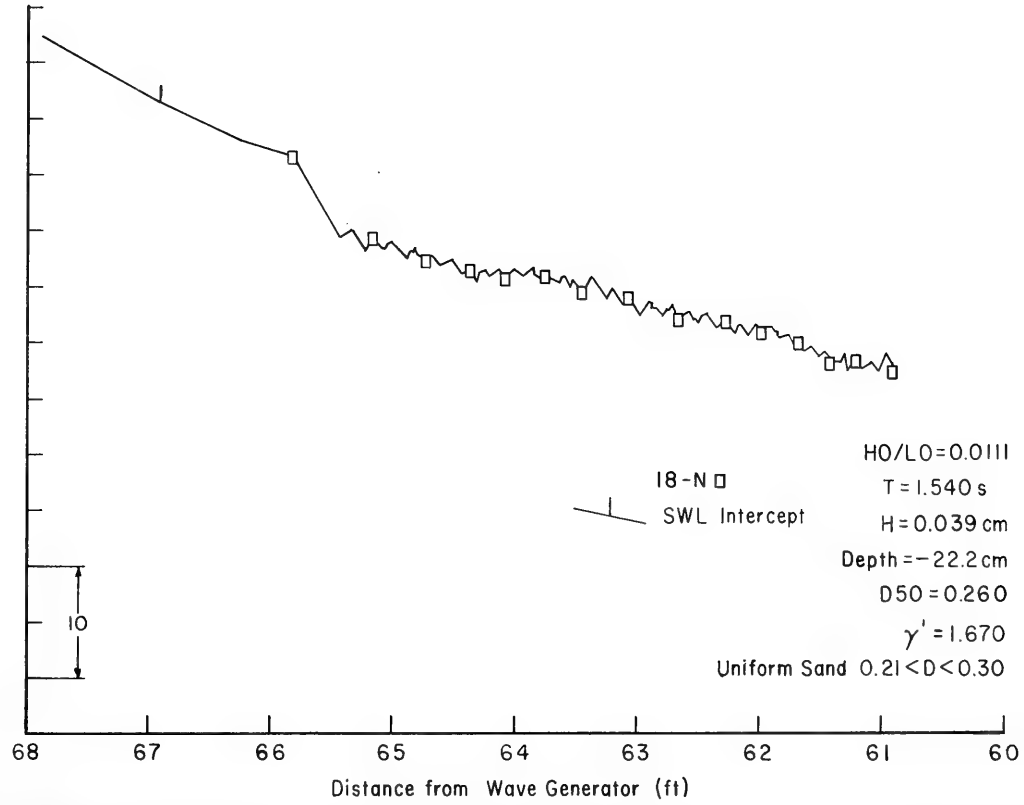

13-N□
SWL Intercept
H0/L0 = 0.0111
T = 1.540s
H = 0.039cm
Depth = -22.2cm
D50 = 0.500
γ' = 1.670
Uniform Sand 0.42<D<0.5
10cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

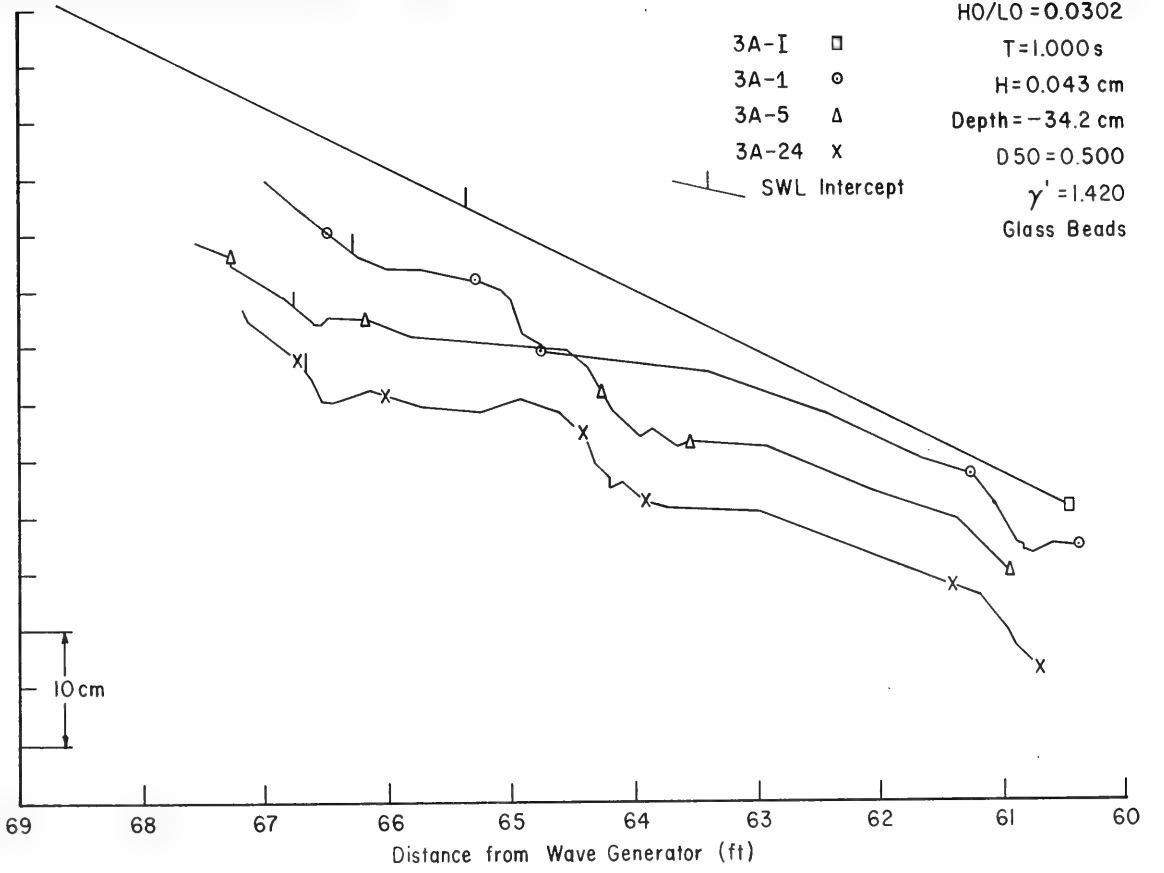

14-N □
SWL Intercept
H0/L0 = 0.0111
T = 1.540s
H = 0.039 cm
Depth = - 22.2 cm
D50 = 0.560
γ' = 1.670
1C Sand
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

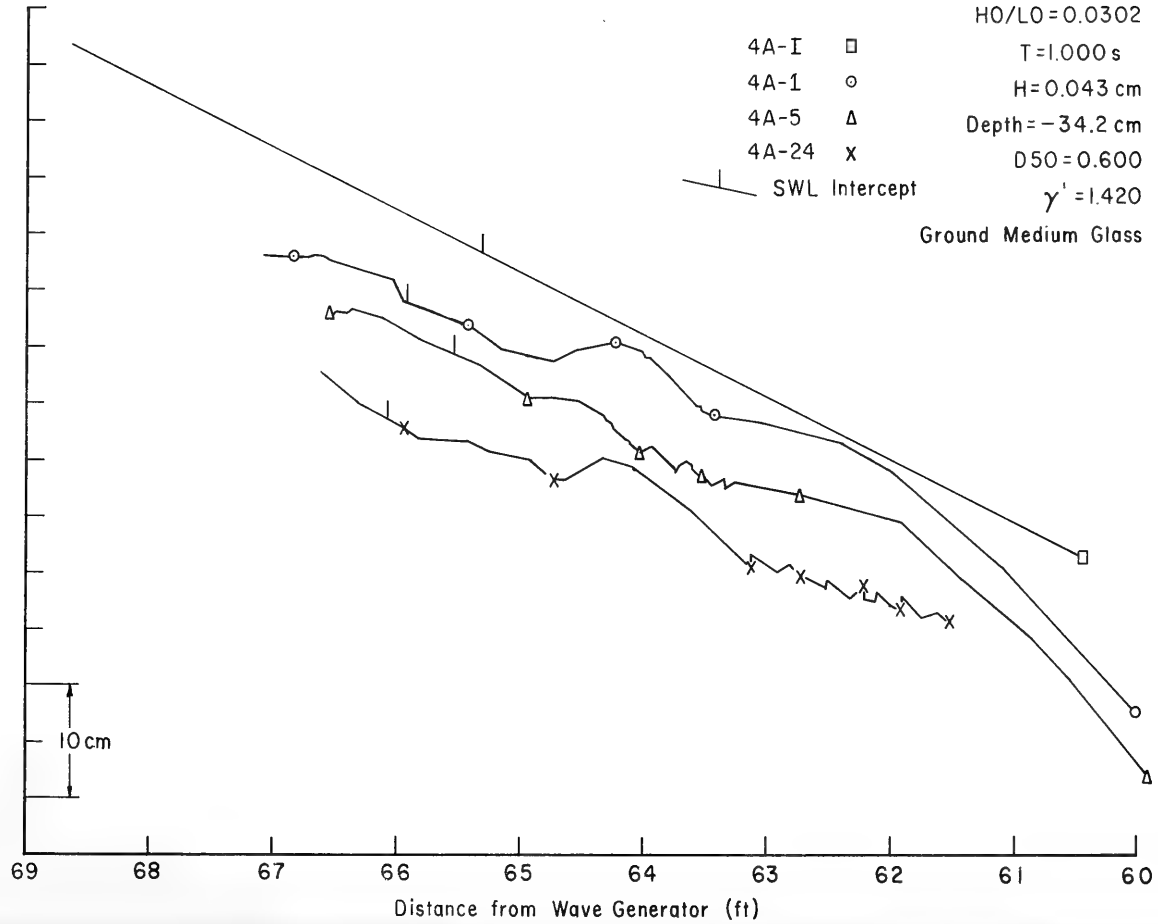

15-N □
SWL Intercept
H0/L0=0.0302
T=1.000s
H=0.043cm
Depth=−22.2cm
D50=0.260
γ'=1.670
Uniform Sand 0.21<D<0.30
10cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

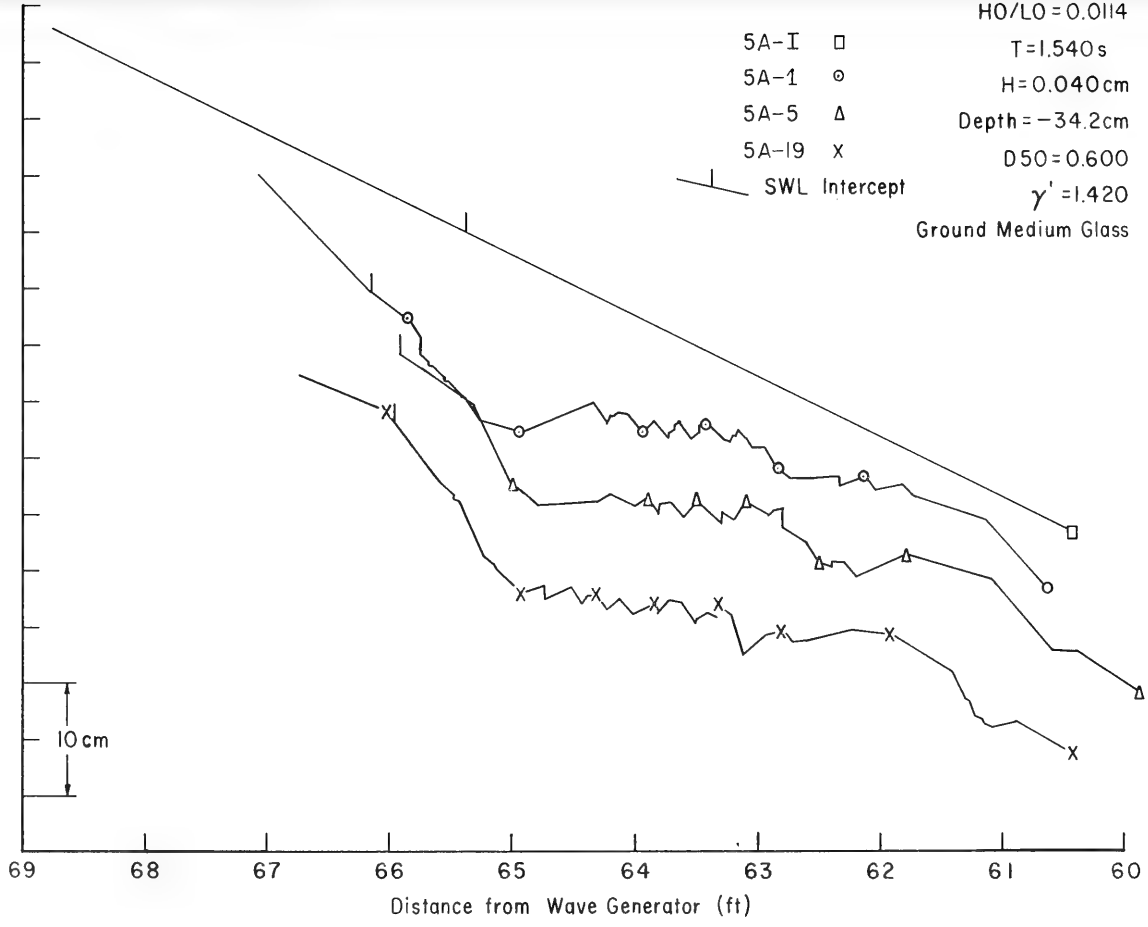

HO/LO = 0.0302
16-N □
T = 1.000s
SWL Intercept
H = 0.043cm
Depth = −22.2cm
D50 = 0.260
γ' = 1.670
Uniform Sand 0.21<D<0.30
10cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

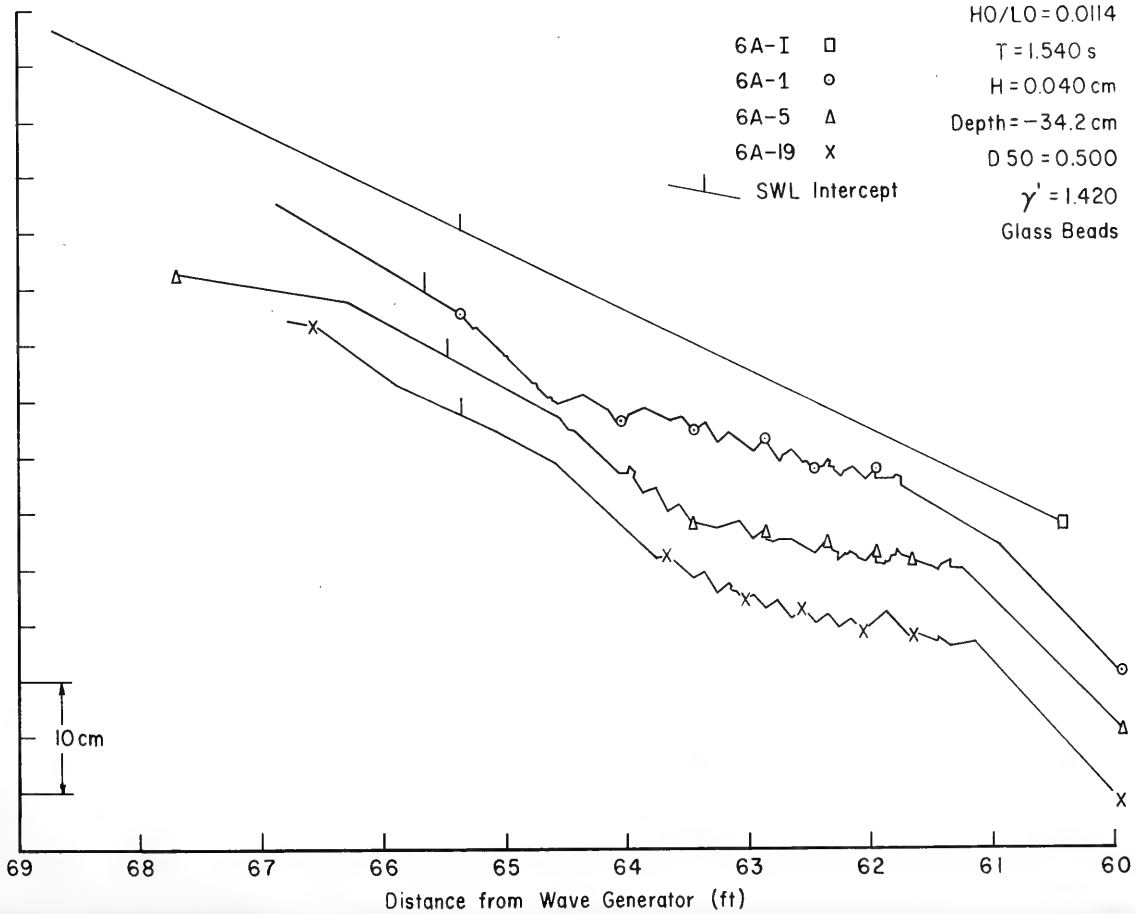

17-N □
SWL Intercept
H0/L0 = 0.0111
T = 1.540s
H = 0.039 cm
Depth = -22.2 cm
D50 = 0.260
γ' = 1.670
Uniform Sand 0.21< D< 0.30
10cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

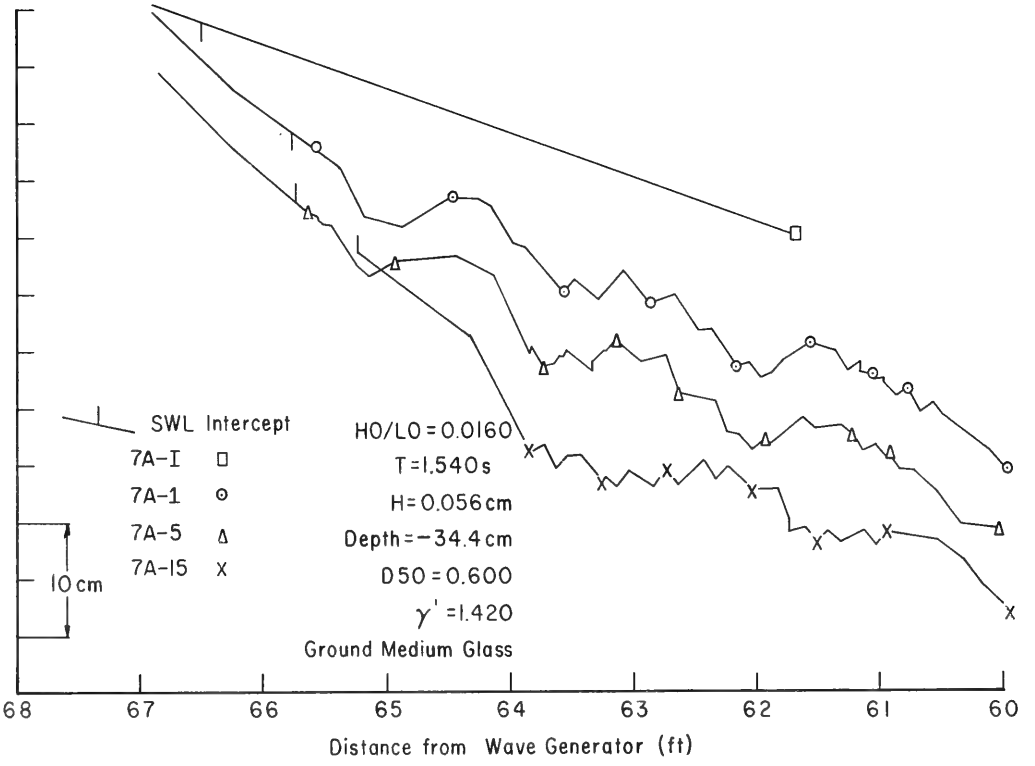

18-N□
SWL Intercept
H0/L0=0.0111
T=1.540 s
H=0.039 cm
Depth=−22.2 cm
D50=0.260
γ'=1.670
Uniform Sand 0.21<D<0.30
10
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

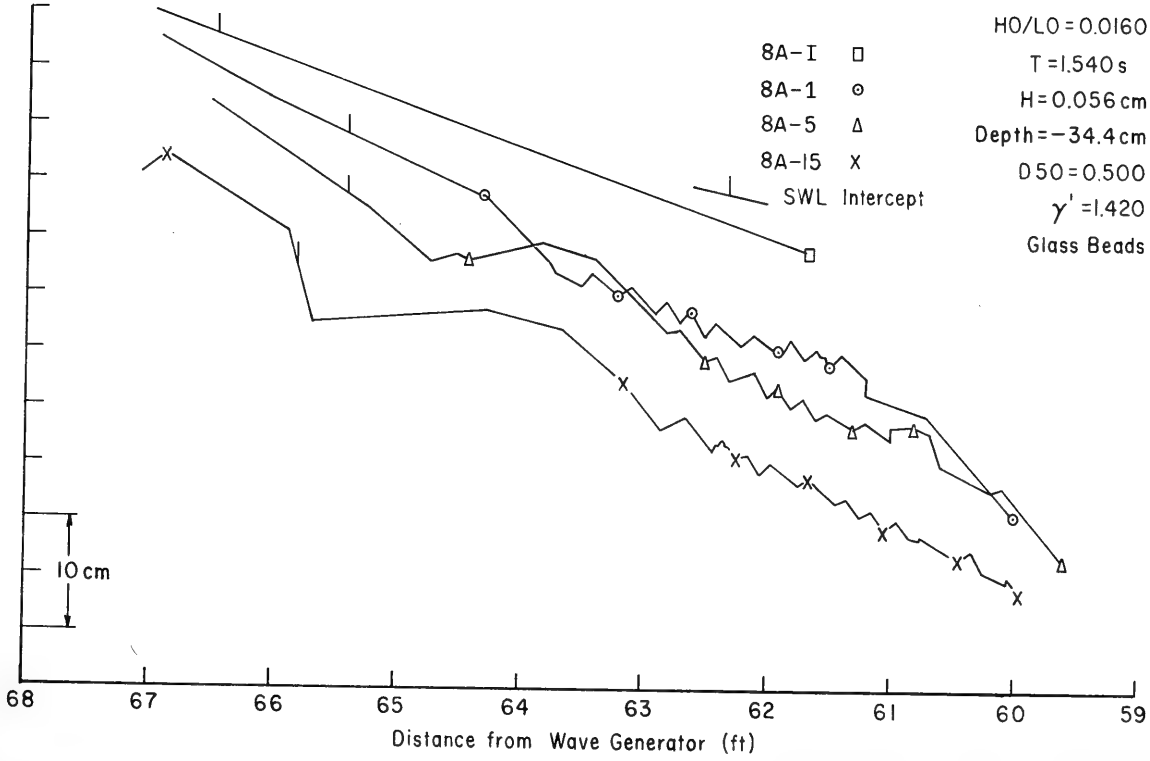

HO/LO = 0.0302
T = 1.000 s
H = 0.043 cm
Depth = −34.2 cm
D50 = 0.500
γ' = 1.420
Glass Beads
3A-I
3A-1
3A-5
3A-24
SWL Intercept
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

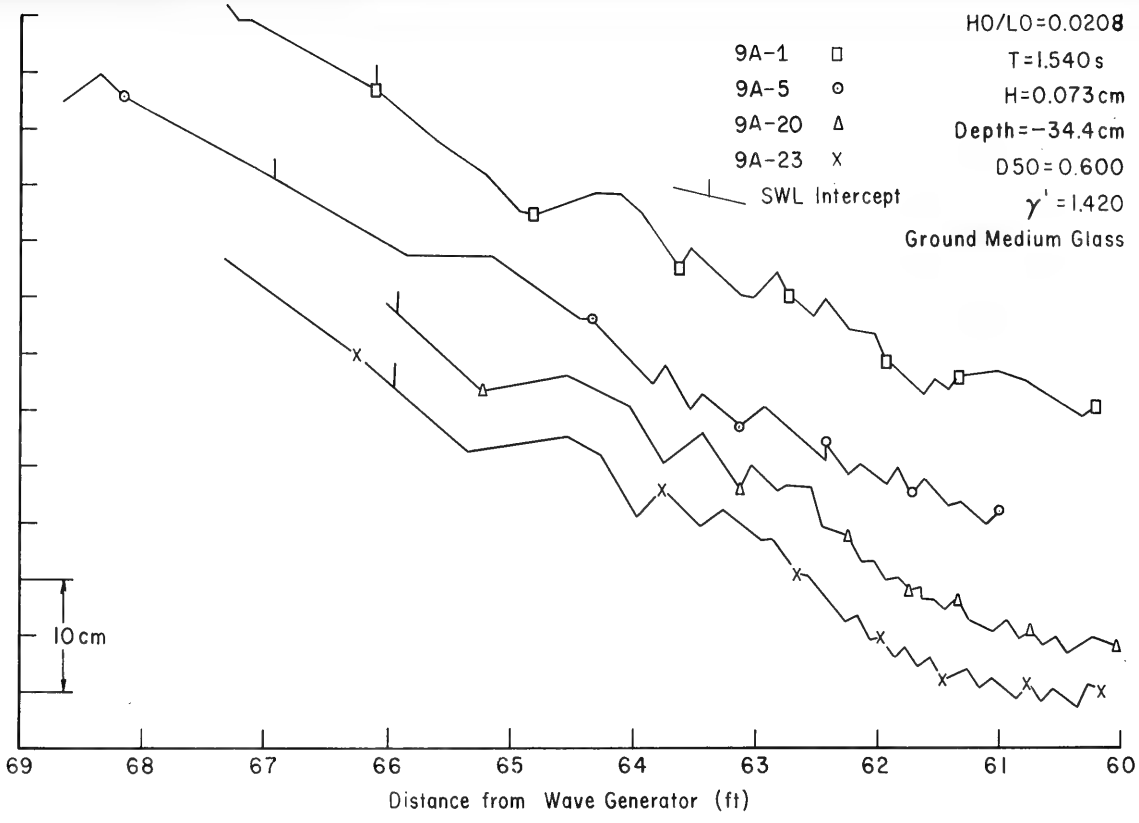

H0/L0 = 0.0302
T = 1.000 s
H = 0.043 cm
Depth = −34.2 cm
D50 = 0.600
γ' = 1.420
Ground Medium Glass
4A-I
4A-1
4A-5
4A-24
SWL Intercept
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

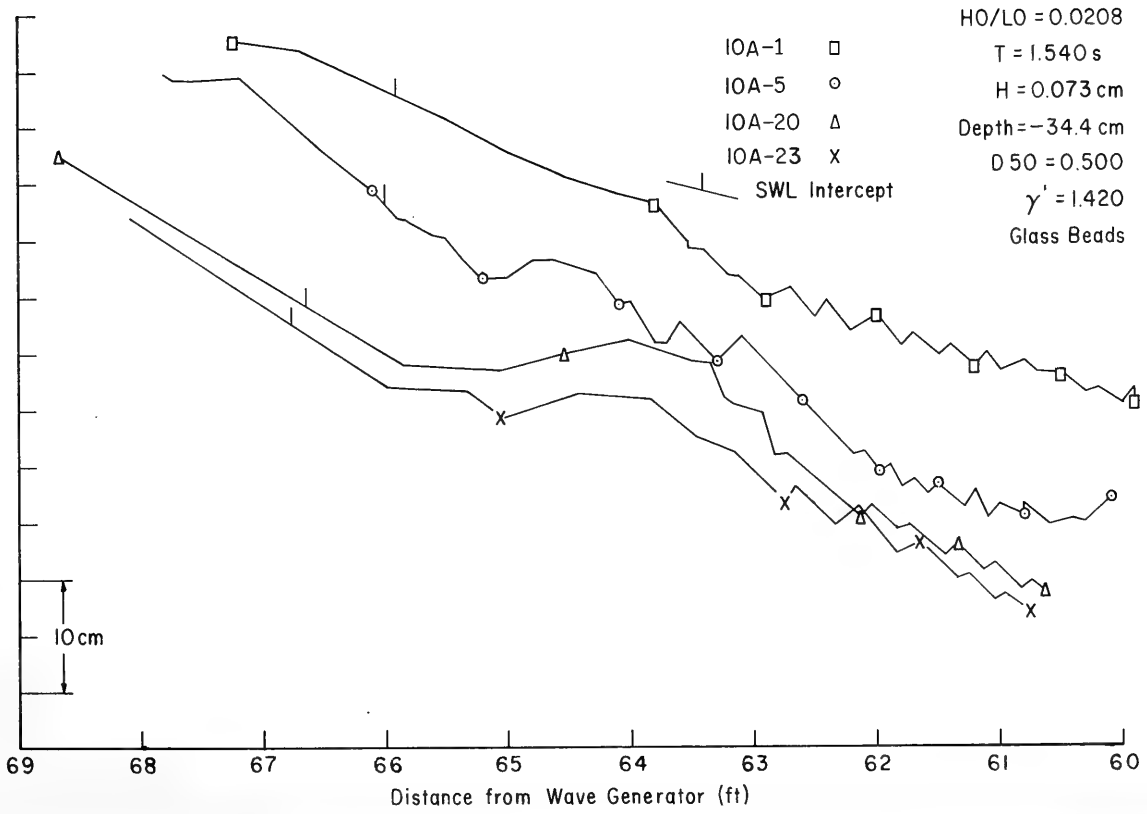

H0/L0 = 0.0114
T = 1.540 s
H = 0.040 cm
Depth = −34.2 cm
D50 = 0.600
γ' = 1.420
Ground Medium Glass
5A-I □
5A-1 ⊙
5A-5 Δ
5A-19 X
SWL Intercept
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

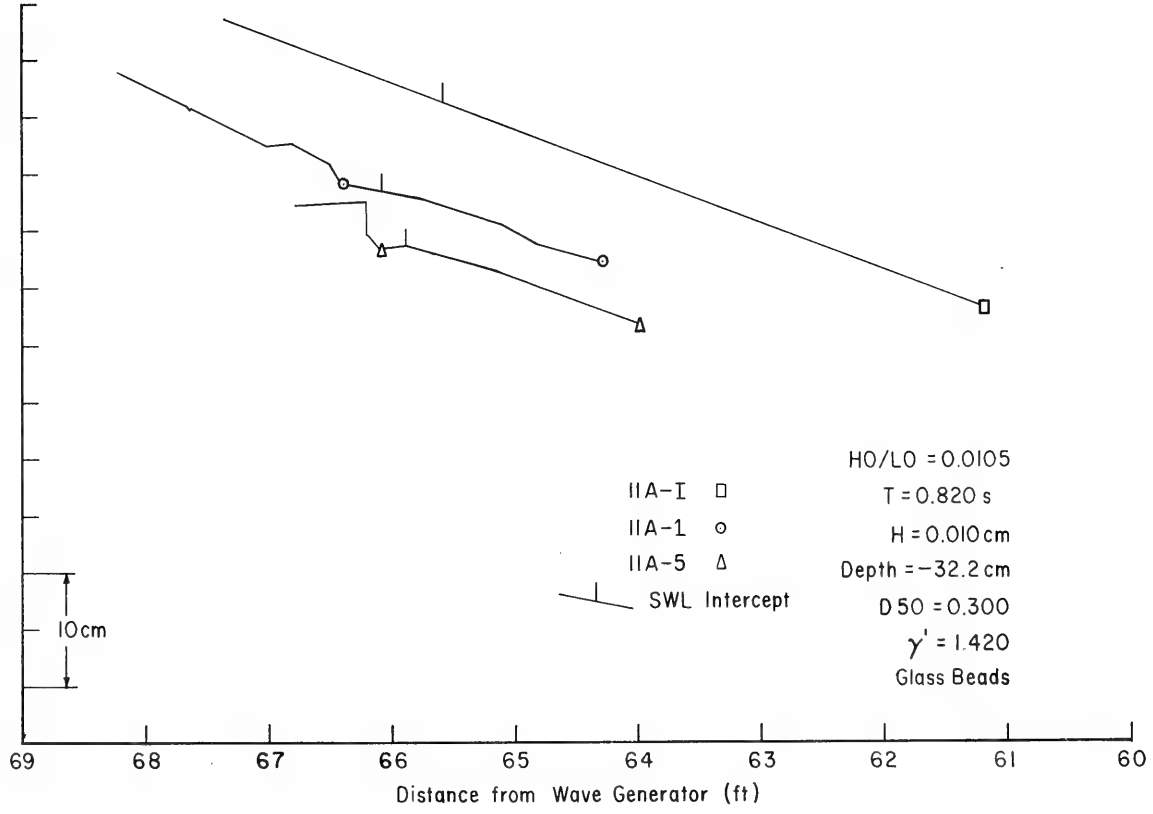

H0/L0 = 0.0114
T = 1.540 s
H = 0.040 cm
Depth = −34.2 cm
D 50 = 0.500
γ' = 1.420
Glass Beads
6A-I
6A-1
6A-5
6A-19
SWL Intercept
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

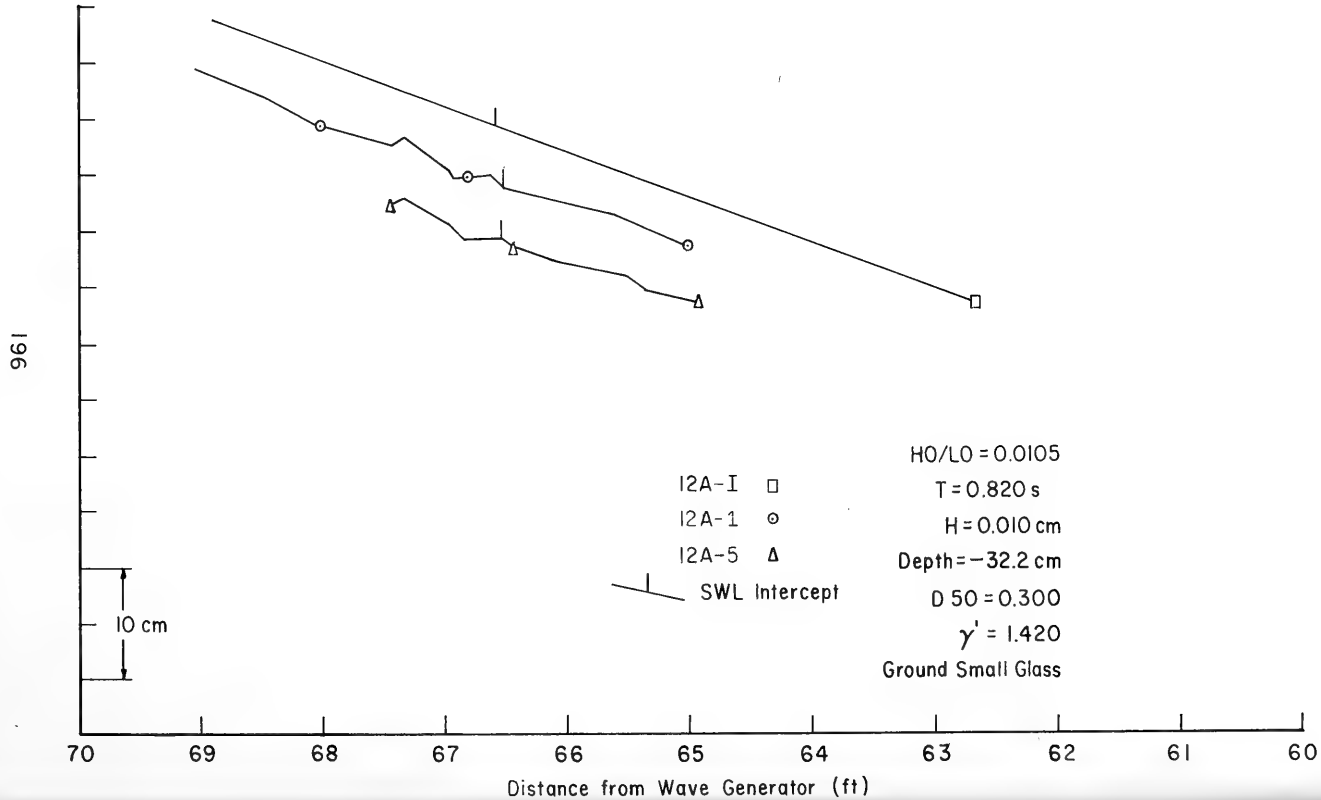

SWL Intercept
7A-I □
7A-1 ⊙
7A-5 Δ
7A-15 X
10 cm
H0/L0 = 0.0160
T = 1.540 s
H = 0.056 cm
Depth = −34.4 cm
D50 = 0.600
γ' = 1.420
Ground Medium Glass
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

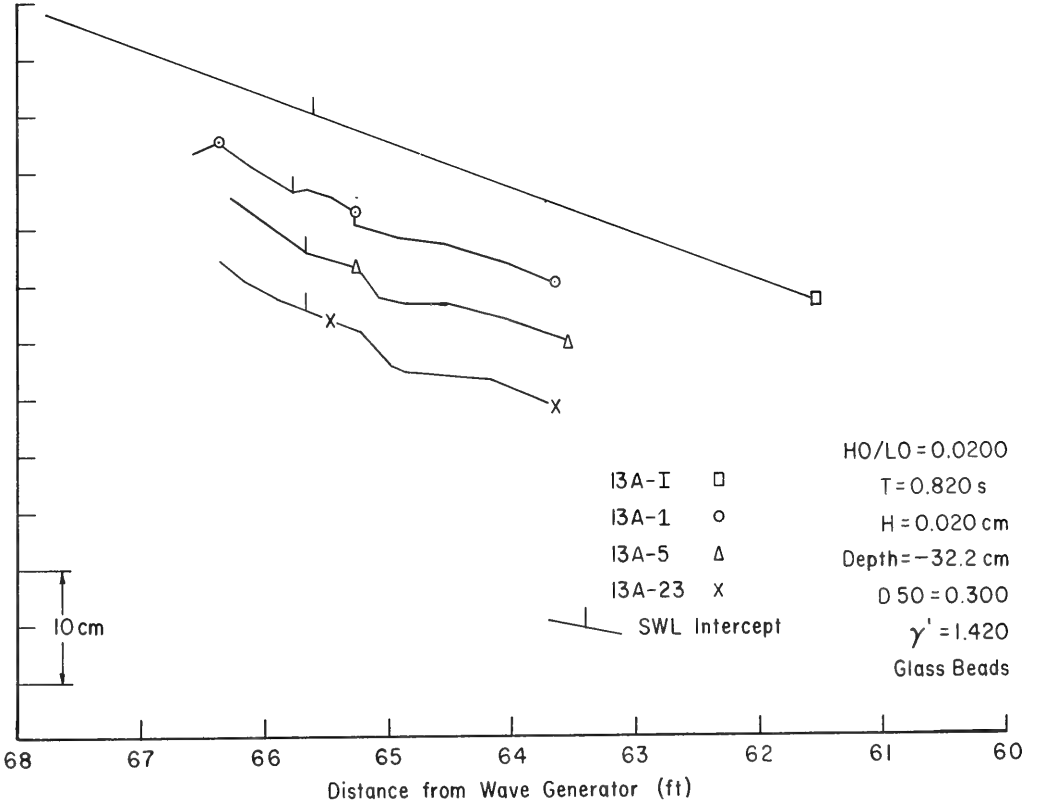

8A-I
8A-1
8A-5
8A-15
SWL Intercept
H0/L0 = 0.0160
T = 1.540 s
H = 0.056 cm
Depth = −34.4 cm
D50 = 0.500
γ' = 1.420
Glass Beads
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

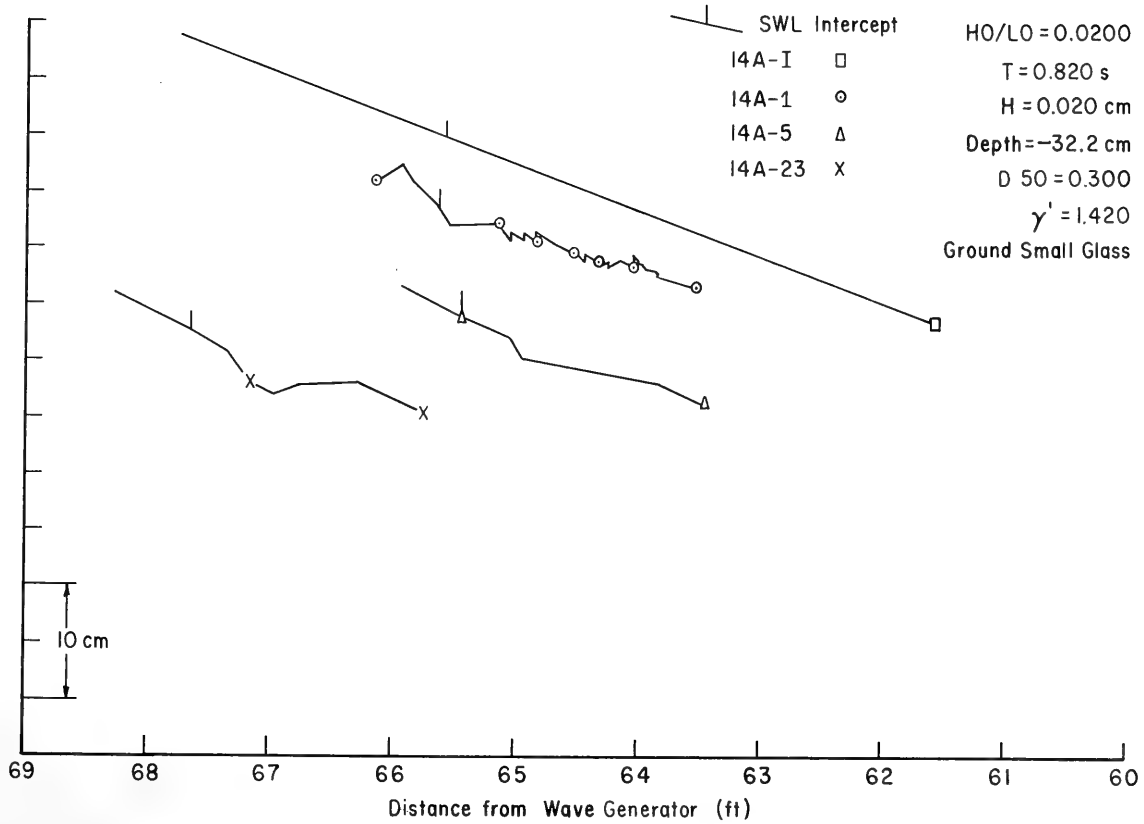

H0/L0=0.0208
T=1.540s
H=0.073cm
Depth=−34.4cm
D50=0.600
γ' =1.420
Ground Medium Glass
9A-1
9A-5
9A-20
9A-23
SWL Intercept
10cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

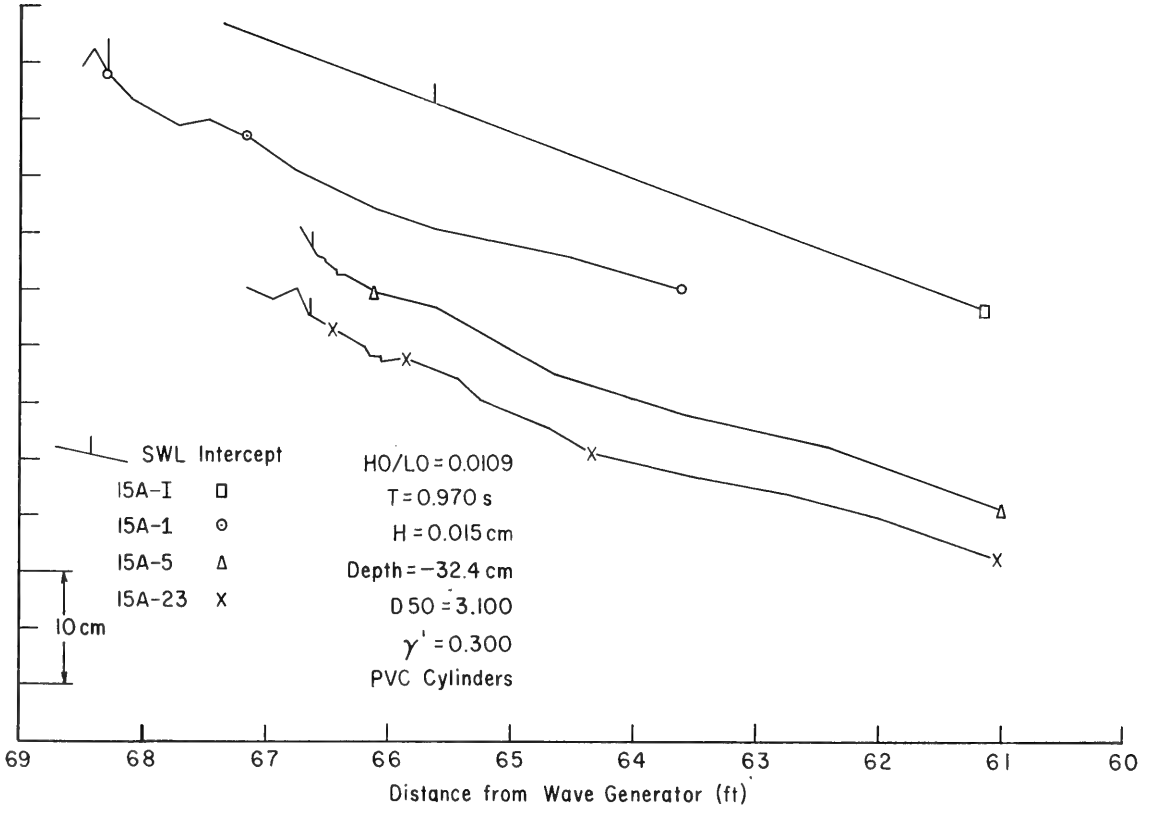

H0/L0 = 0.0208
T = 1.540 s
H = 0.073 cm
Depth = −34.4 cm
D 50 = 0.500
γ' = 1.420
Glass Beads
10A-1 □
10A-5 ○
10A-20 Δ
10A-23 X
SWL Intercept
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

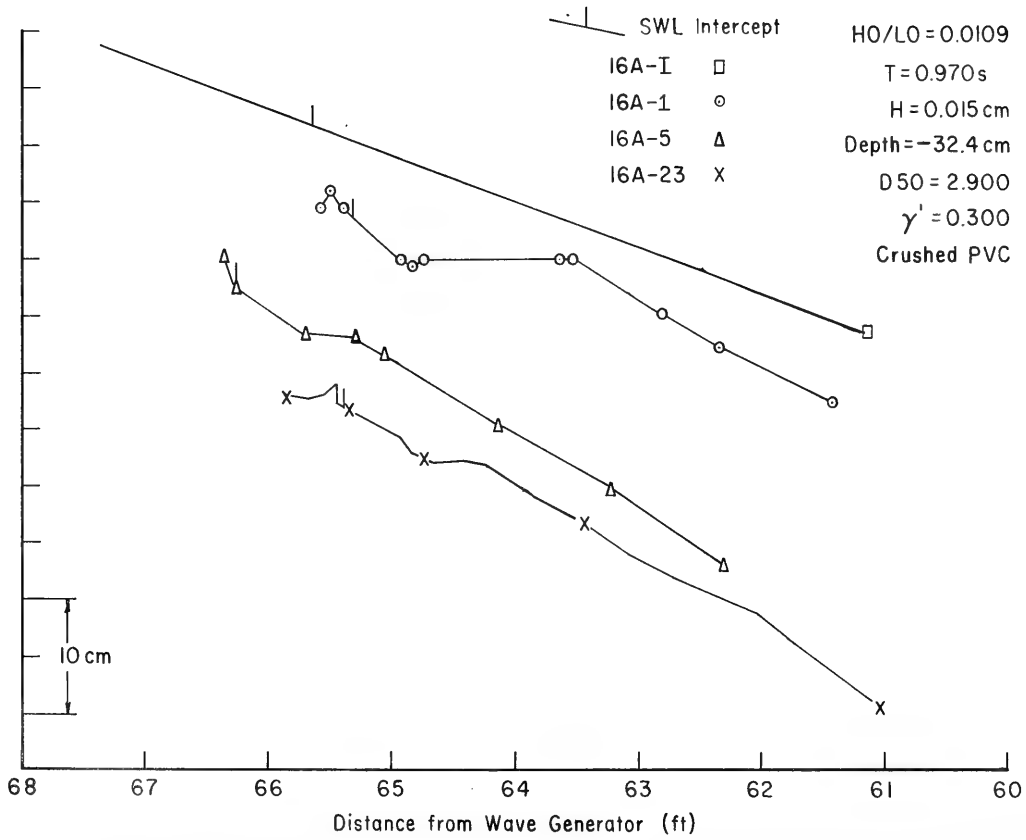

IIA-I
IIA-1
IIA-5
SWL Intercept
H0/L0 = 0.0105
T = 0.820 s
H = 0.010 cm
Depth = −32.2 cm
D 50 = 0.300
γ' = 1.420
Glass Beads
10cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

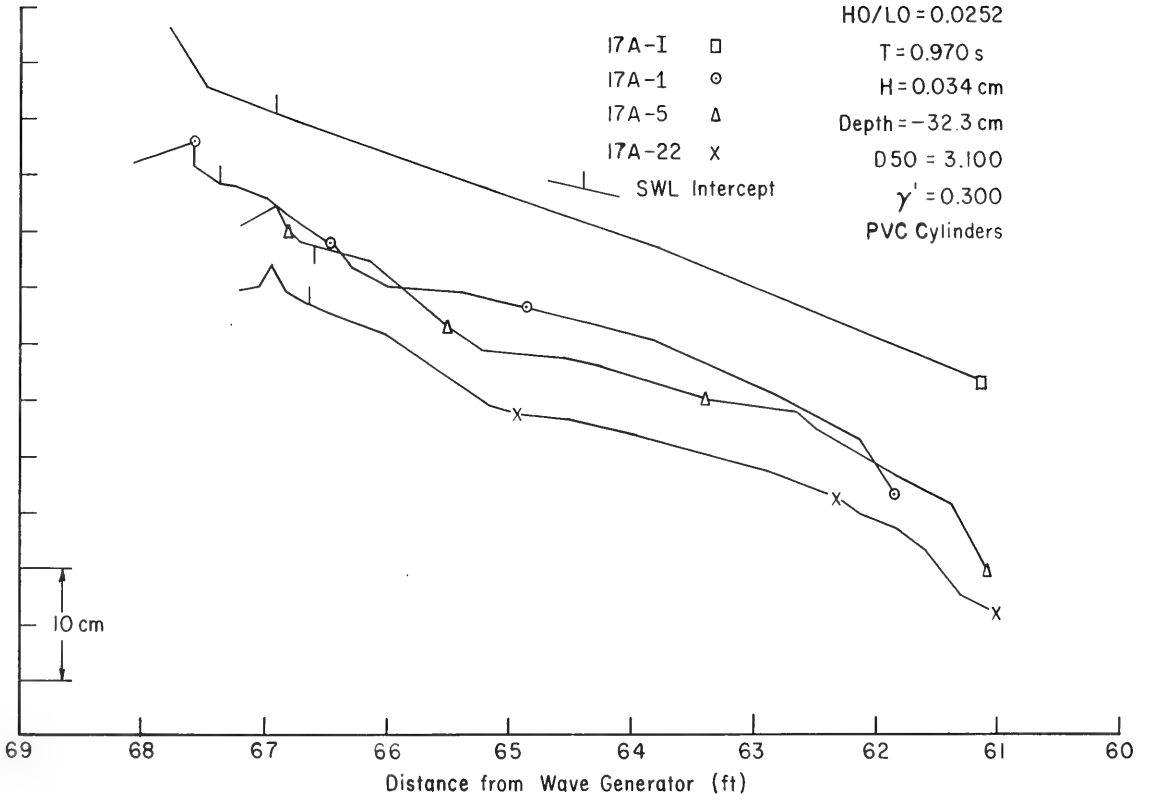

196
10 cm
12A-I
12A-1
12A-5
SWL Intercept
H0/L0 = 0.0105
T = 0.820 s
H = 0.010 cm
Depth = −32.2 cm
D 50 = 0.300
γ' = 1.420
Ground Small Glass
70
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

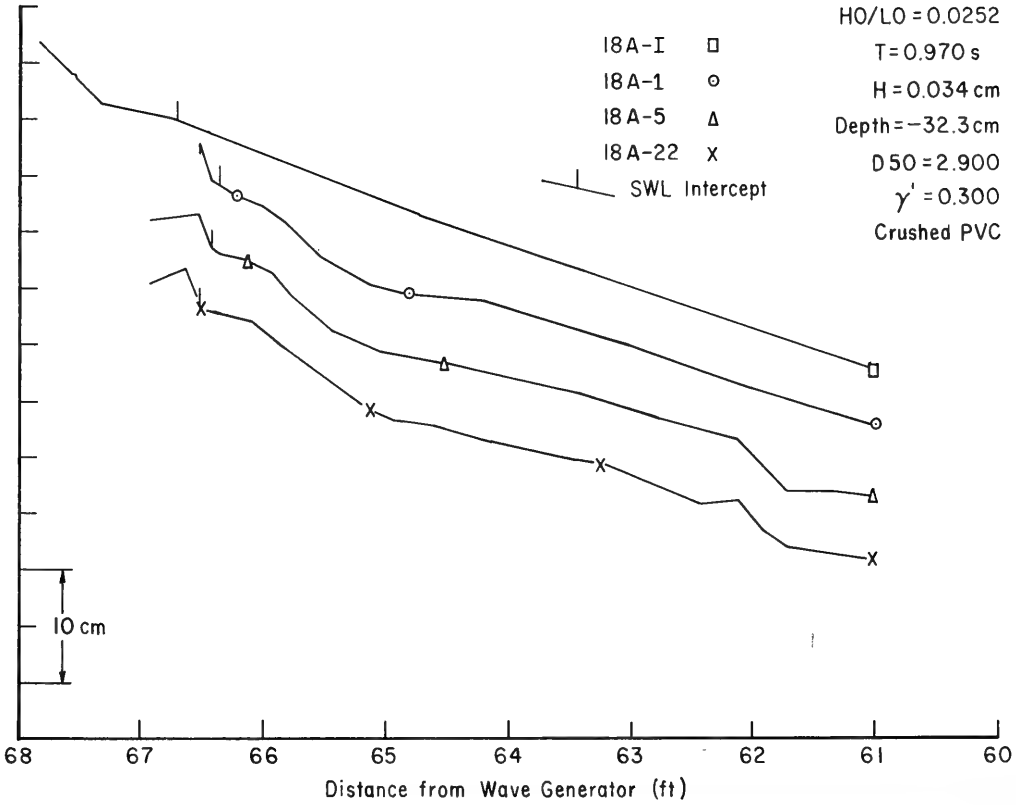

13A-I
13A-1
13A-5
13A-23
SWL Intercept
H0/L0 = 0.0200
T = 0.820 s
H = 0.020 cm
Depth = −32.2 cm
D 50 = 0.300
γ' = 1.420
Glass Beads
10 cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

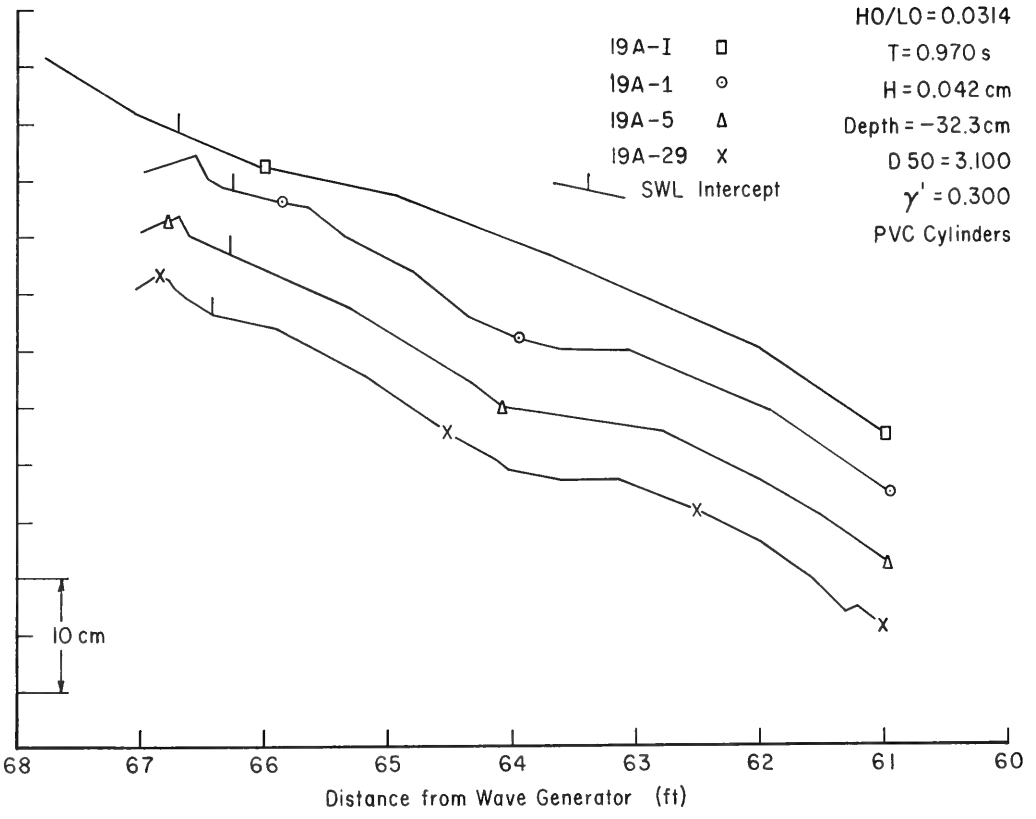

SWL Intercept
14A-I
14A-1
14A-5
14A-23
H0/L0 = 0.0200
T = 0.820 s
H = 0.020 cm
Depth = −32.2 cm
D 50 = 0.300
γ' = 1.420
Ground Small Glass
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

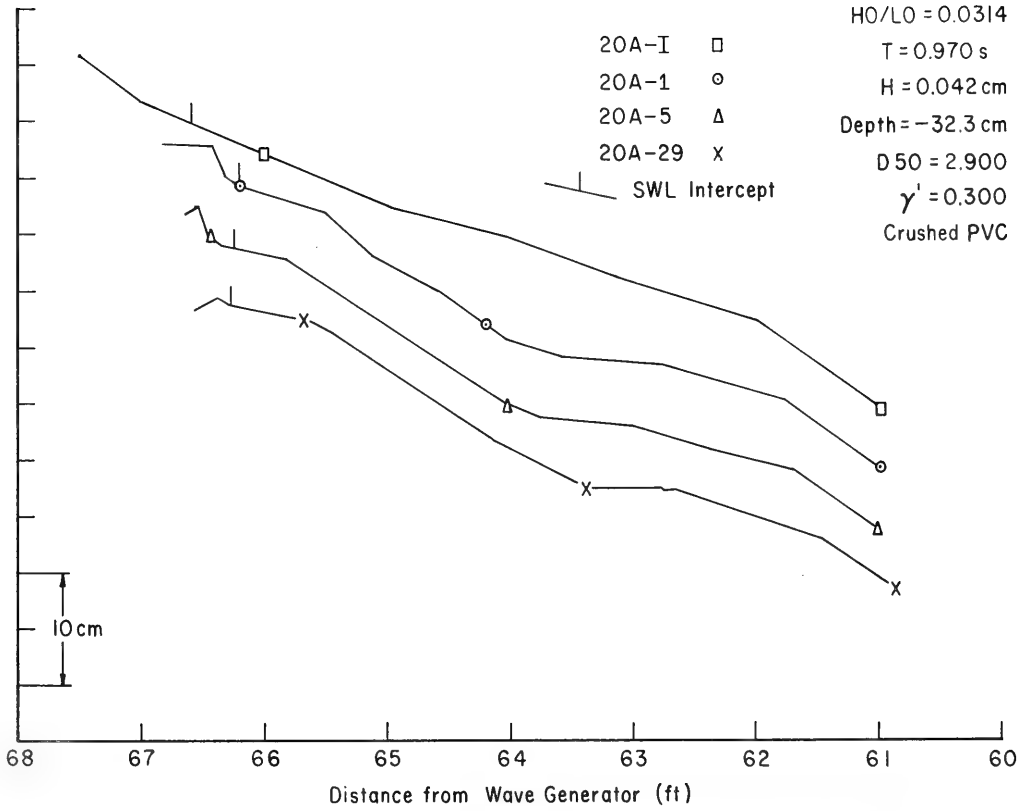

SWL Intercept
15A-I
15A-1
15A-5
15A-23
10 cm
H0/L0 = 0.0109
T = 0.970 s
H = 0.015 cm
Depth = −32.4 cm
D 50 = 3.100
γ' = 0.300
PVC Cylinders
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

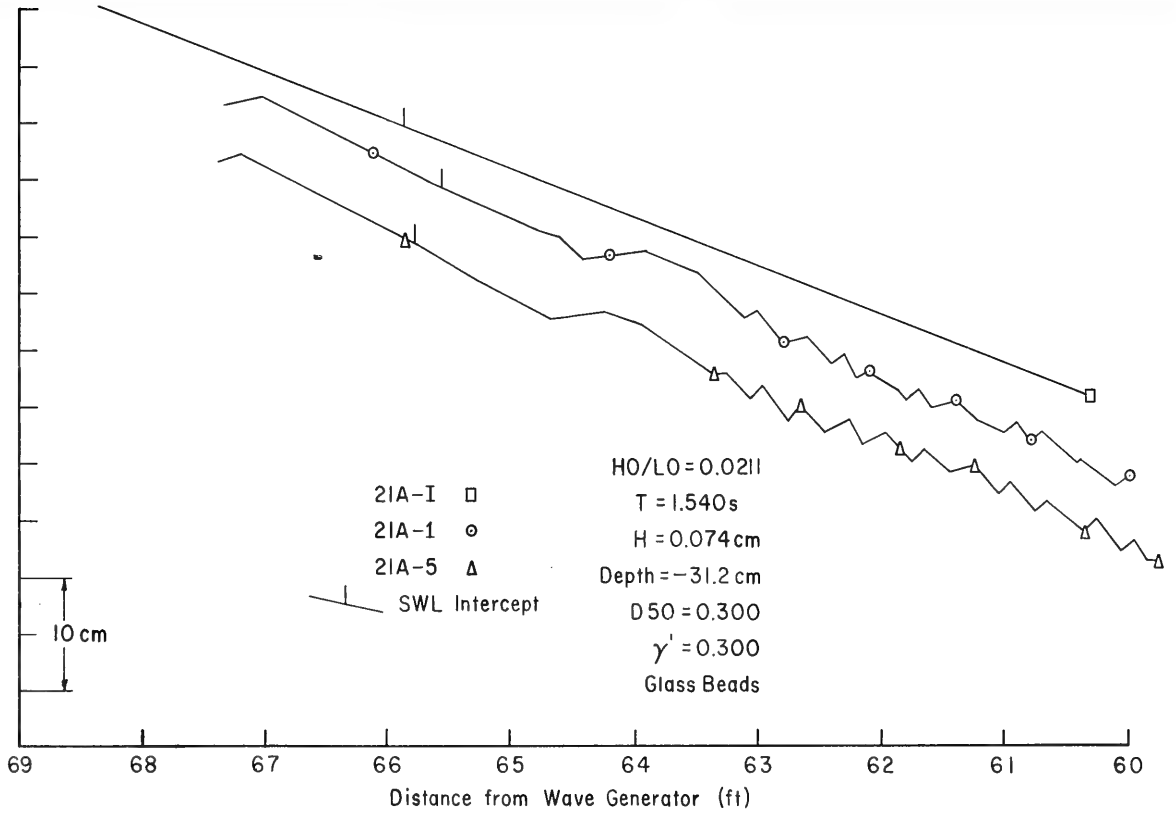

SWL Intercept
16A-I
16A-1
16A-5
16A-23
H0/L0 = 0.0109
T = 0.970 s
H = 0.015 cm
Depth = −32.4 cm
D50 = 2.900
γ' = 0.300
Crushed PVC
10 cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

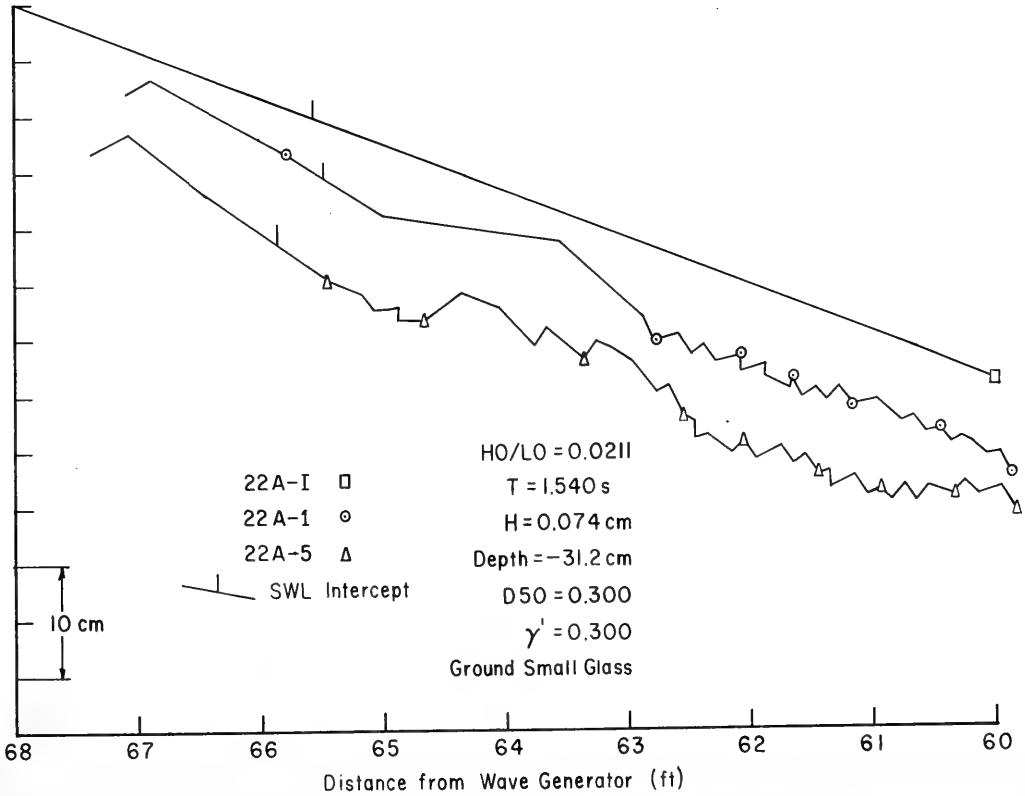

H0/L0 = 0.0252
T = 0.970 s
H = 0.034 cm
Depth = −32.3 cm
D50 = 3.100
γ' = 0.300
PVC Cylinders
17A-I
17A-1
17A-5
17A-22
SWL Intercept
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

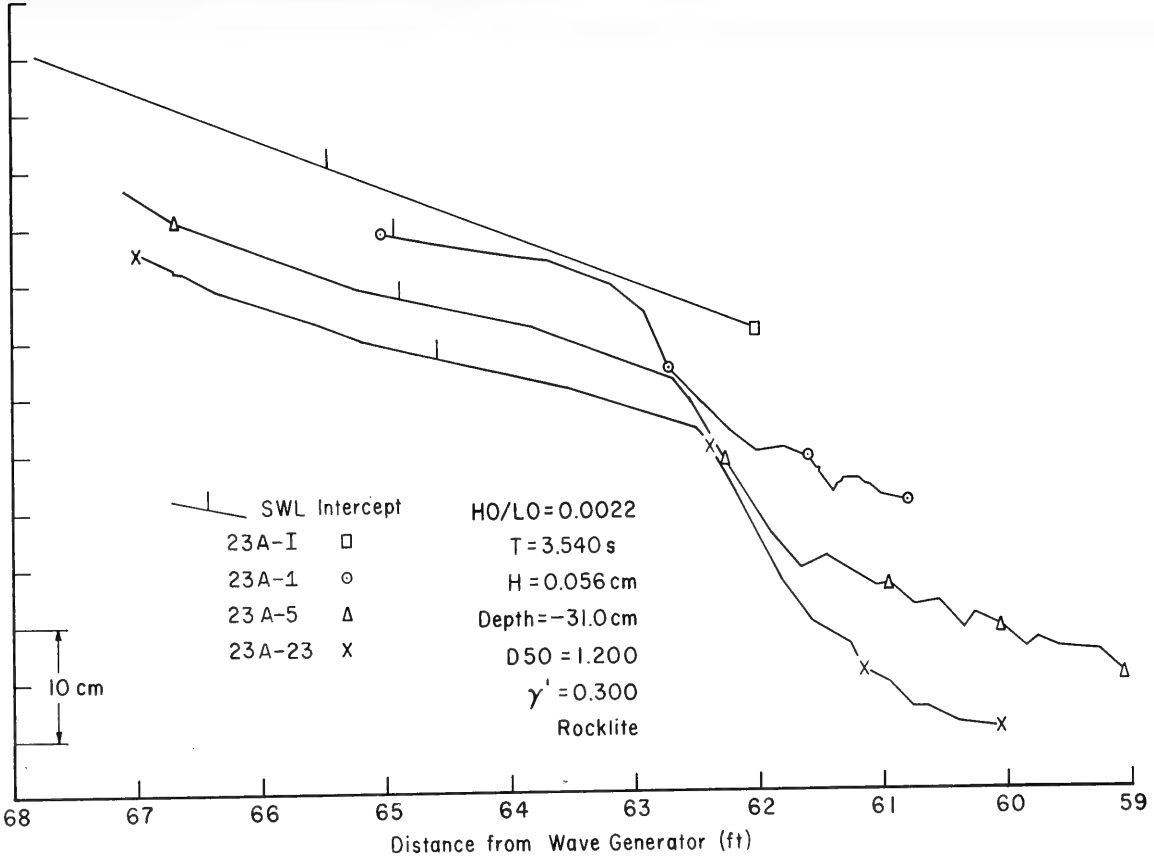

H0/L0 = 0.0252
T = 0.970 s
H = 0.034 cm
Depth = −32.3 cm
D50 = 2.900
γ' = 0.300
Crushed PVC
18A-I
18A-1
18A-5
18A-22
SWL Intercept
10 cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

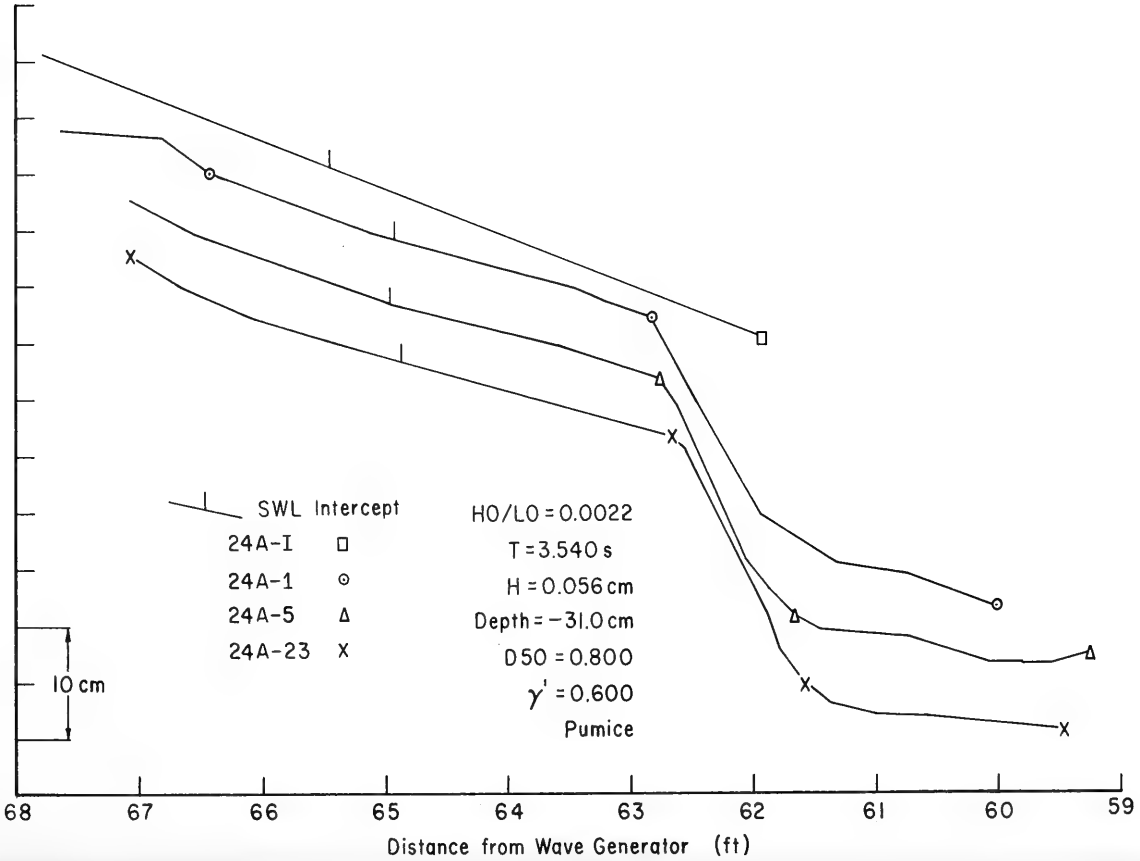

H0/L0 = 0.0314
T = 0.970 s
H = 0.042 cm
Depth = −32.3cm
D 50 = 3.100
γ' = 0.300
PVC Cylinders
19A-I
19A-1
19A-5
19A-29
SWL Intercept
10 cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

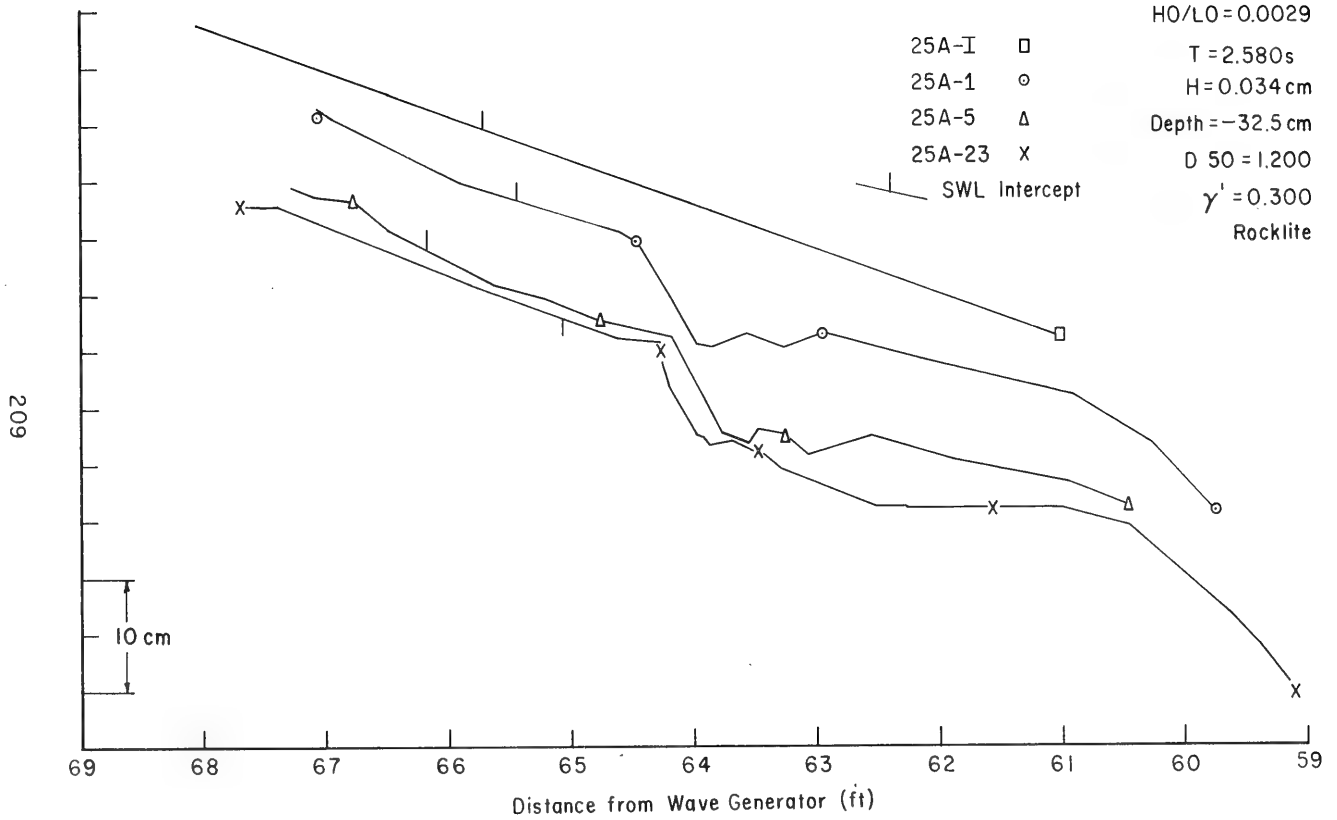

20A-I
20A-1
20A-5
20A-29
SWL Intercept
H0/L0 = 0.0314
T = 0.970 s
H = 0.042 cm
Depth = −32.3 cm
D 50 = 2.900
γ' = 0.300
Crushed PVC
10 cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

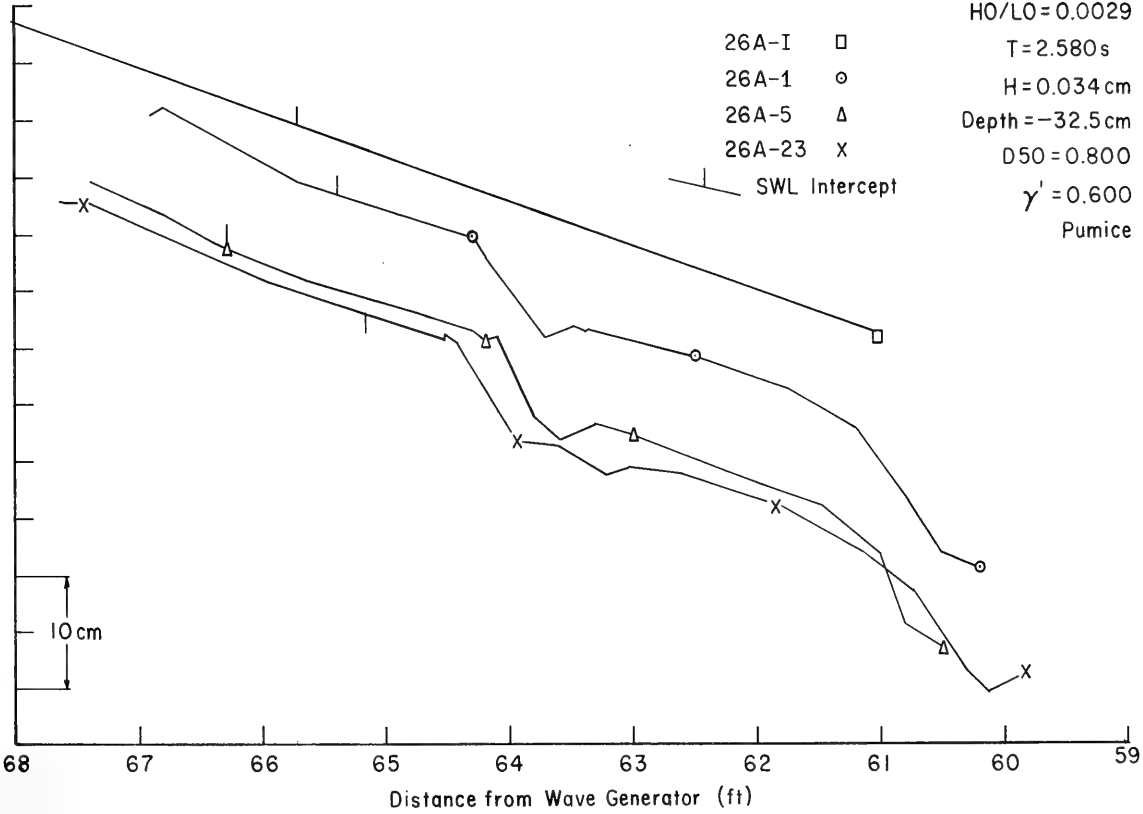

21A-I
21A-1
21A-5
SWL Intercept
H0/L0 = 0.0211
T = 1.540s
H = 0.074cm
Depth = −31.2 cm
D50 = 0.300
γ' = 0.300
Glass Beads
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

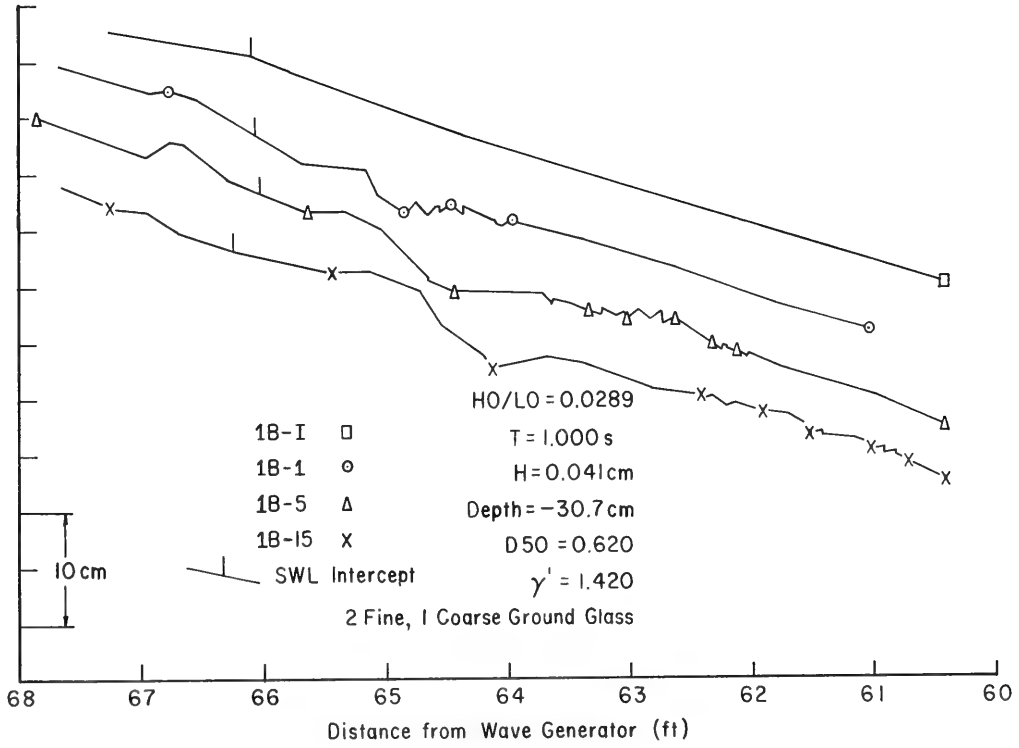

22A-I
22A-1
22A-5
SWL Intercept
10 cm
H0/L0 = 0.0211
T = 1.540 s
H = 0.074 cm
Depth = −31.2 cm
D50 = 0.300
γ' = 0.300
Ground Small Glass
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

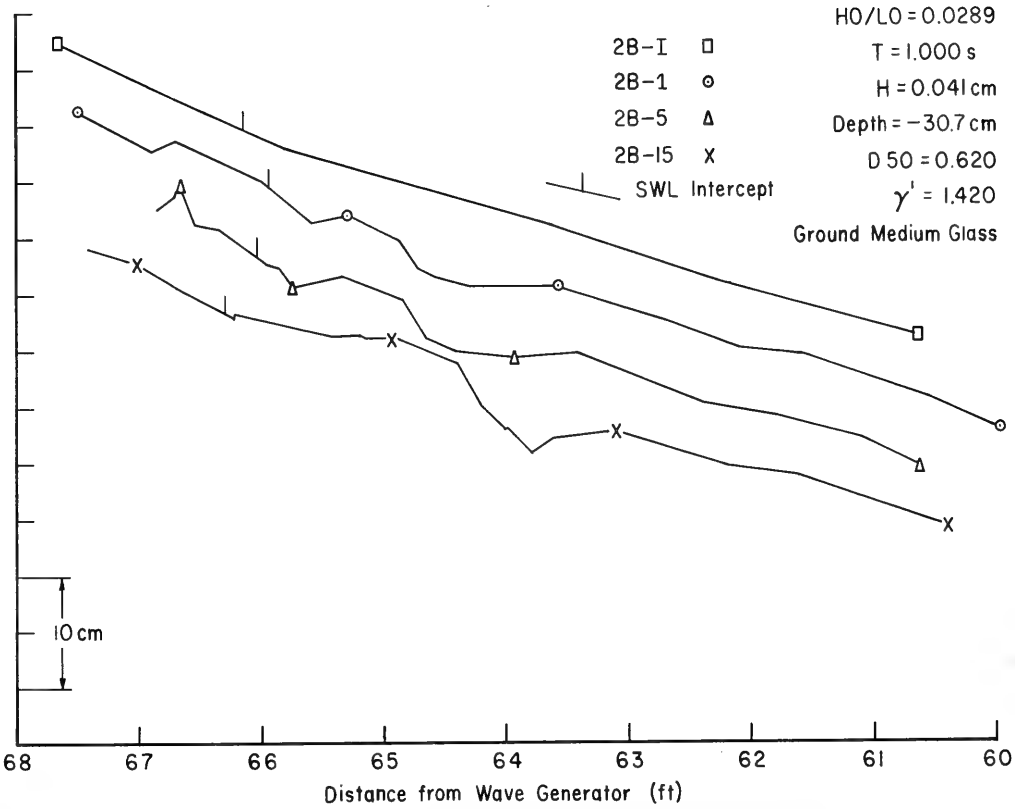

SWL Intercept
23A-I
23A-1
23A-5
23A-23
H0/L0 = 0.0022
T = 3.540 s
H = 0.056 cm
Depth = −31.0 cm
D50 = 1.200
γ' = 0.300
Rocklite
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

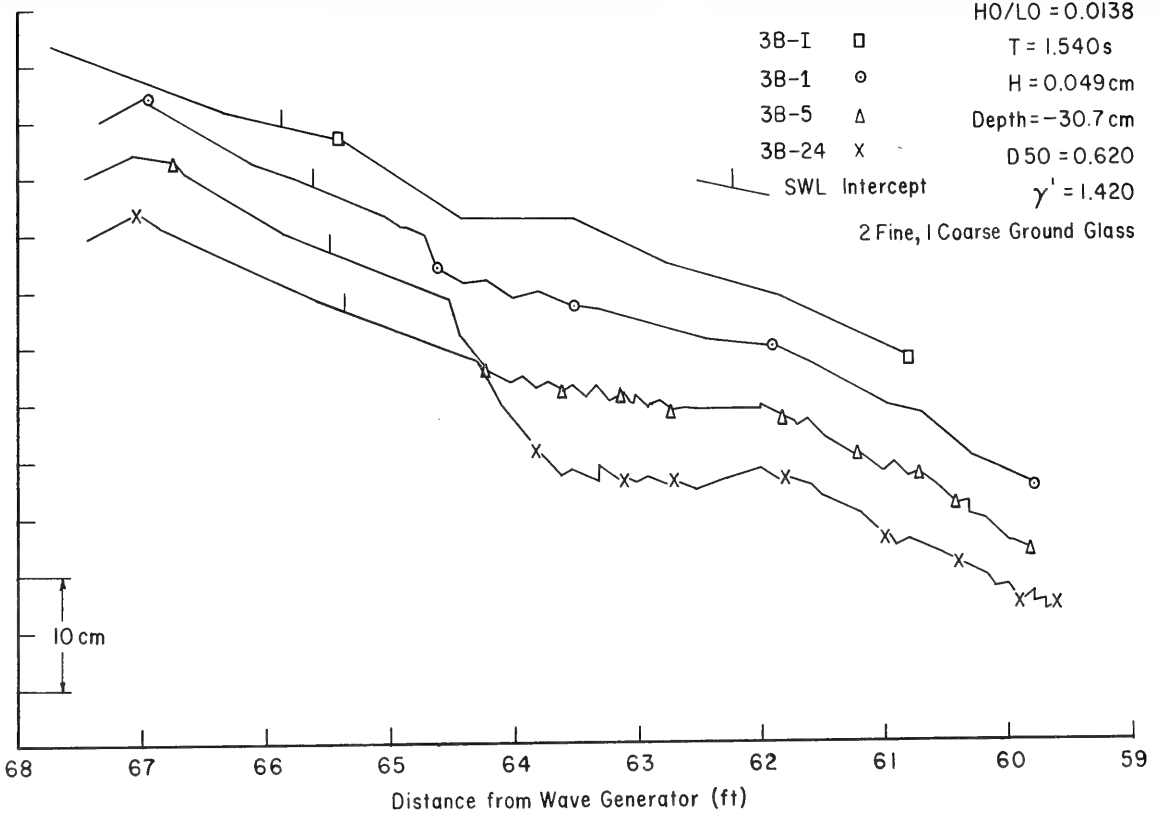

SWL Intercept
24A-I
24A-1
24A-5
24A-23
H0/L0 = 0.0022
T = 3.540 s
H = 0.056 cm
Depth = −31.0 cm
D50 = 0.800
γ' = 0.600
Pumice
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

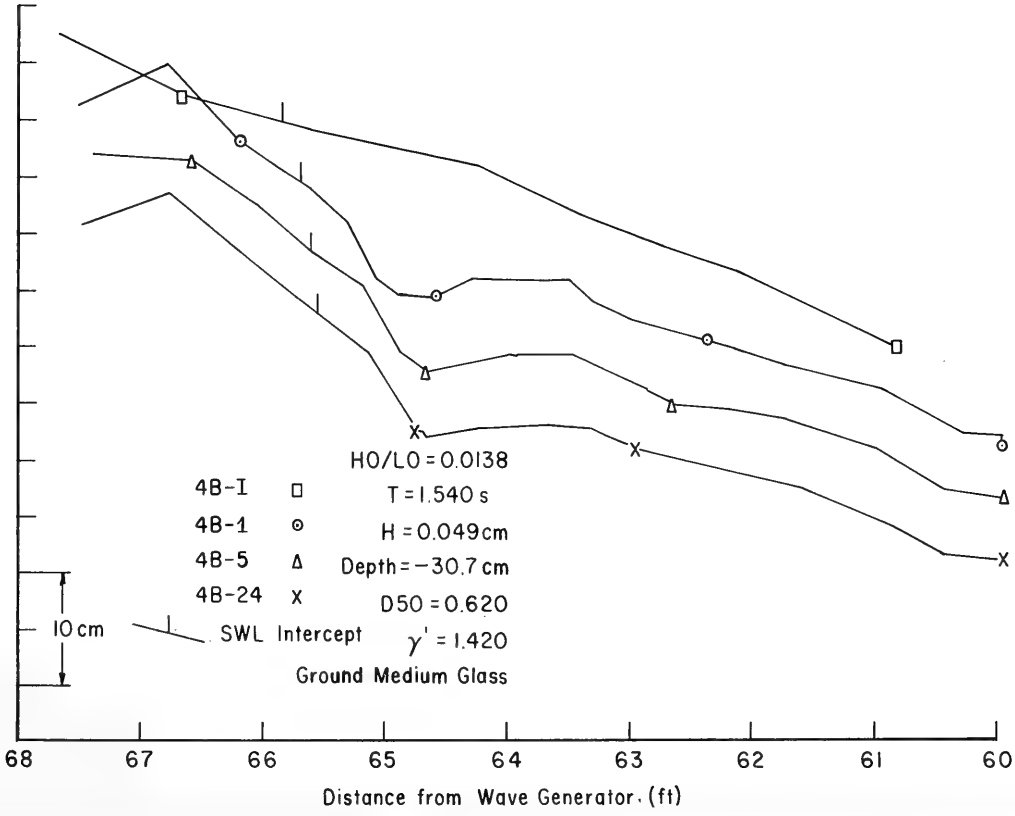

H0/L0 = 0.0029
T = 2.580s
H = 0.034 cm
Depth = −32.5 cm
D 50 = 1.200
γ' = 0.300
Rocklite
25A-I
25A-1
25A-5
25A-23
SWL Intercept
10 cm
69
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

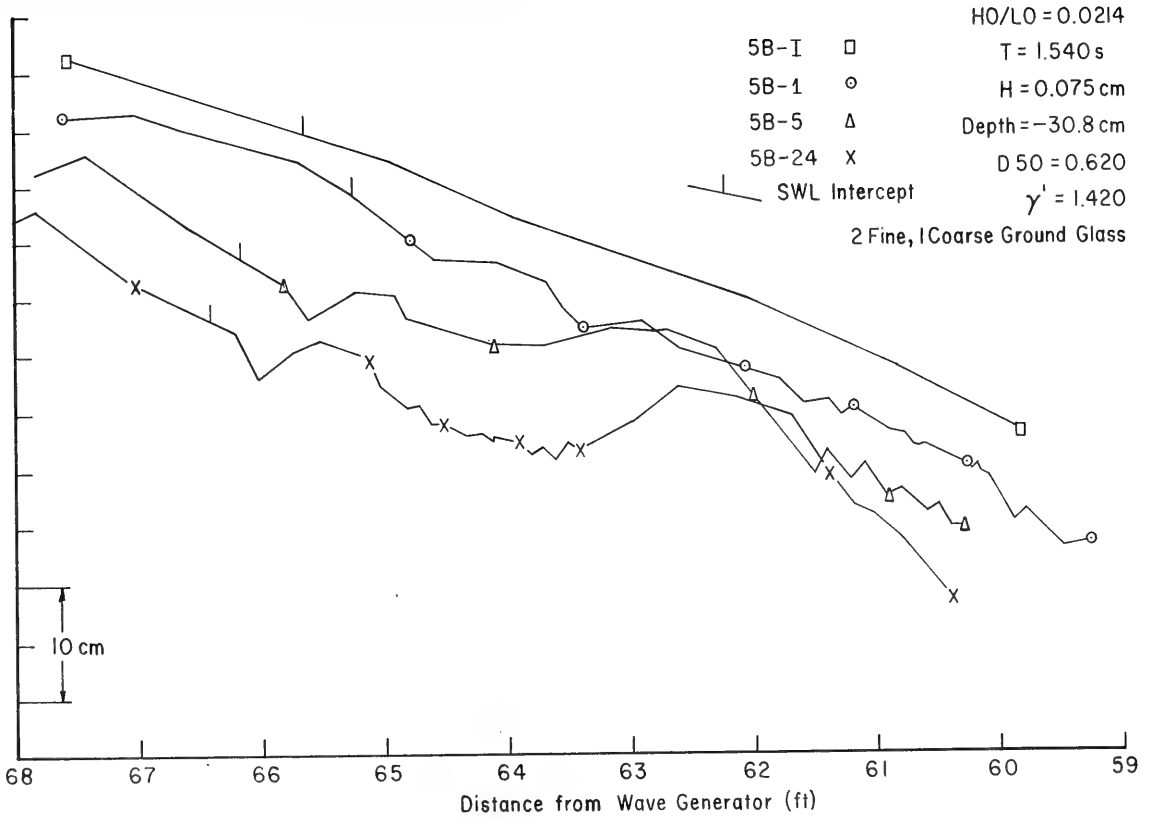

H0/L0 = 0.0029
T = 2.580 s
H = 0.034 cm
Depth = −32.5 cm
D50 = 0.800
γ' = 0.600
Pumice
26A-I
26A-1
26A-5
26A-23
SWL Intercept
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

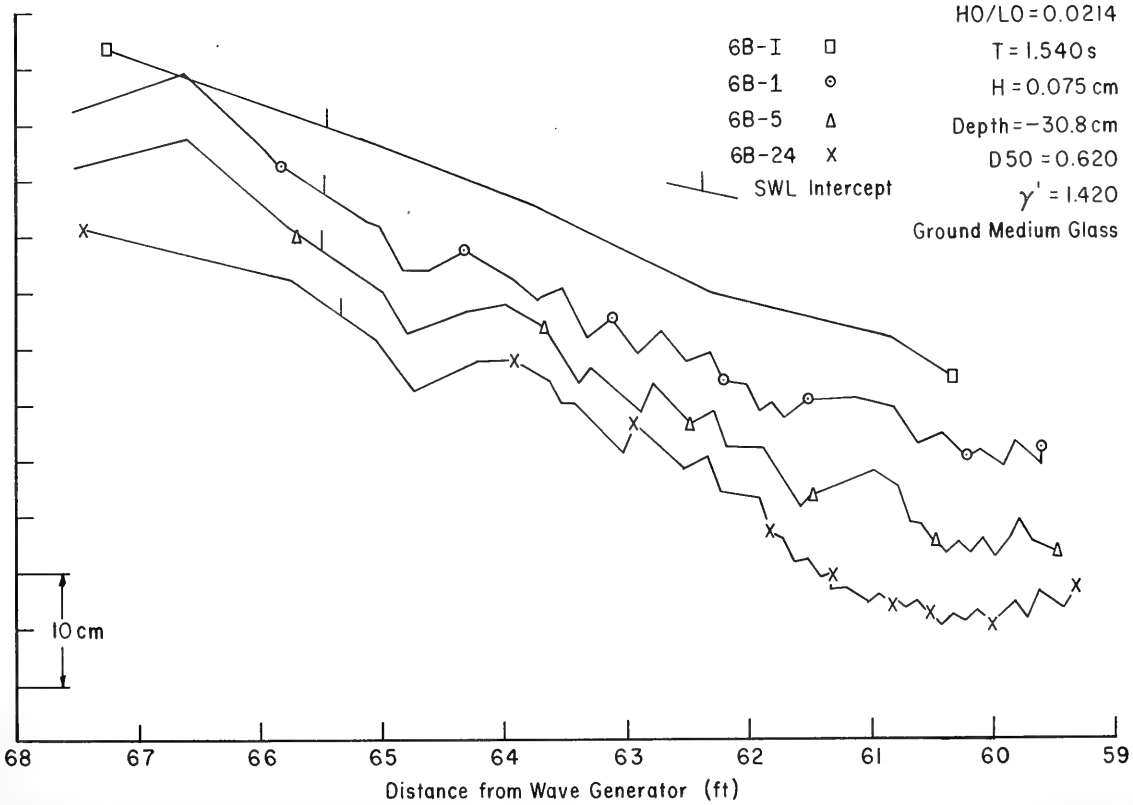

H0/L0 = 0.0289
T = 1.000 s
H = 0.041cm
Depth = −30.7cm
D50 = 0.620
γ' = 1.420
2 Fine, 1 Coarse Ground Glass
1B-I
1B-1
1B-5
1B-15
SWL Intercept
10 cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

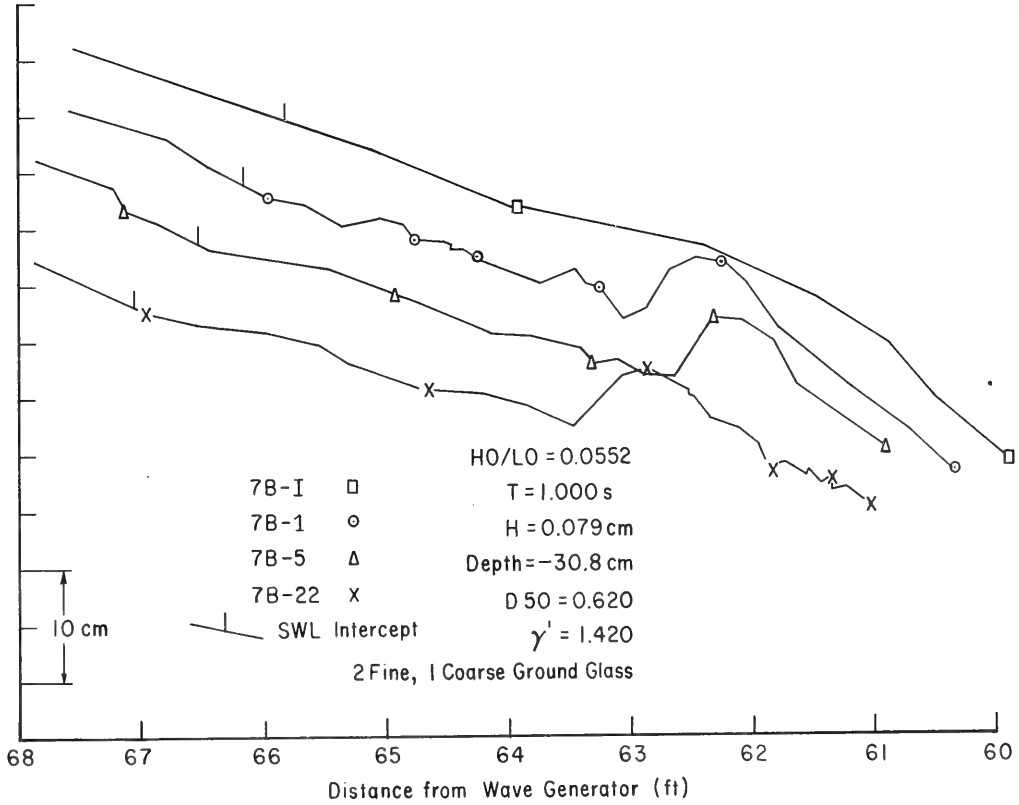

H0/L0 = 0.0289
T = 1.000 s
H = 0.041 cm
Depth = −30.7 cm
D 50 = 0.620
γ' = 1.420
Ground Medium Glass
2B-I
2B-1
2B-5
2B-15
SWL Intercept
10 cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

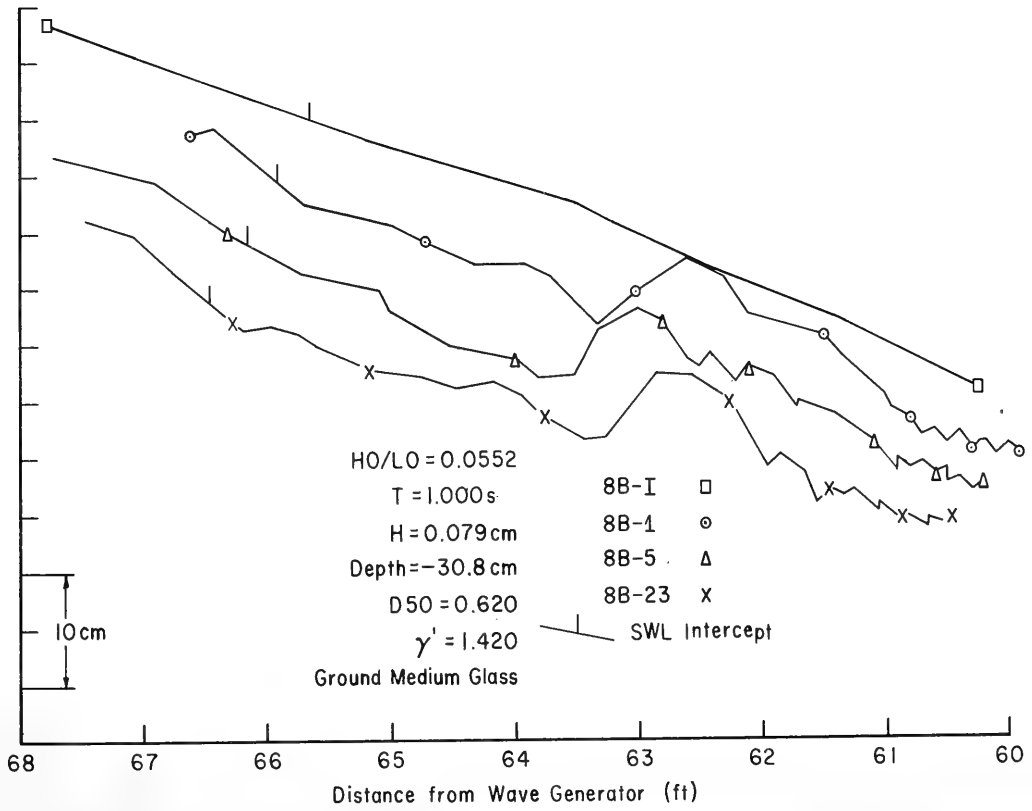

H0/L0 = 0.0138
T = 1.540s
H = 0.049cm
Depth = −30.7cm
D50 = 0.620
γ' = 1.420
2 Fine, 1 Coarse Ground Glass
3B-I
3B-1
3B-5
3B-24
SWL Intercept
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

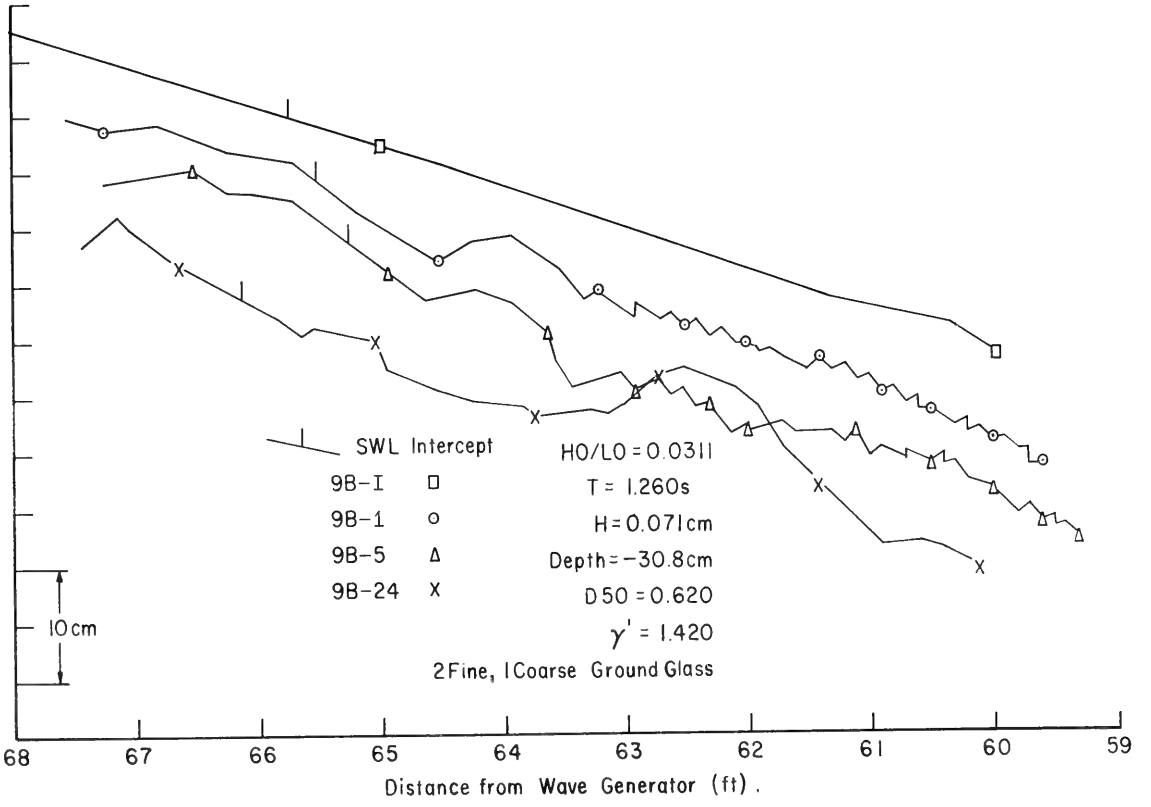

H0/L0 = 0.0138
4B-I
T = 1.540 s
4B-1
H = 0.049cm
4B-5
Depth = −30.7 cm
4B-24
D50 = 0.620
10 cm
SWL Intercept
γ' = 1.420
Ground Medium Glass
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

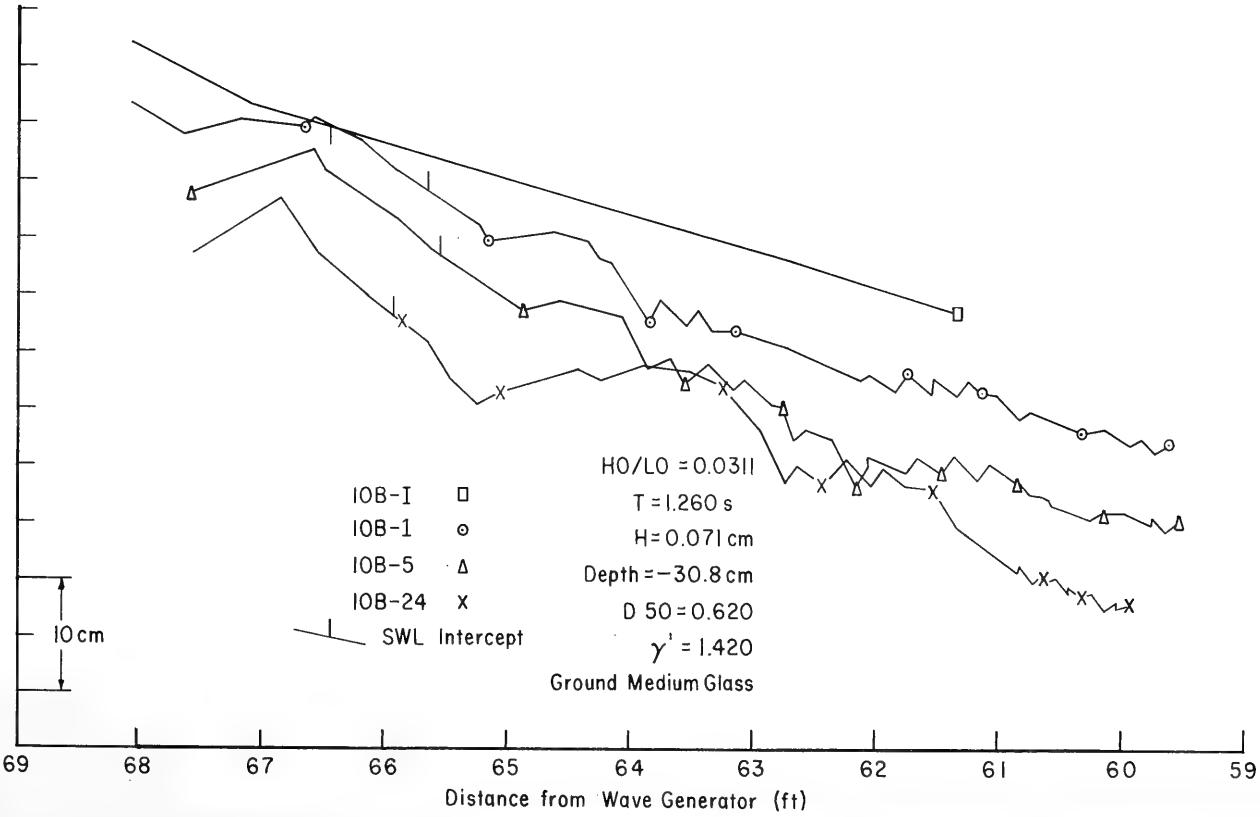

H0/L0 = 0.0214
5B-I
T = 1.540 s
5B-1
H = 0.075 cm
5B-5
Depth = −30.8 cm
5B-24
D 50 = 0.620
SWL Intercept
γ' = 1.420
2 Fine, 1 Coarse Ground Glass
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

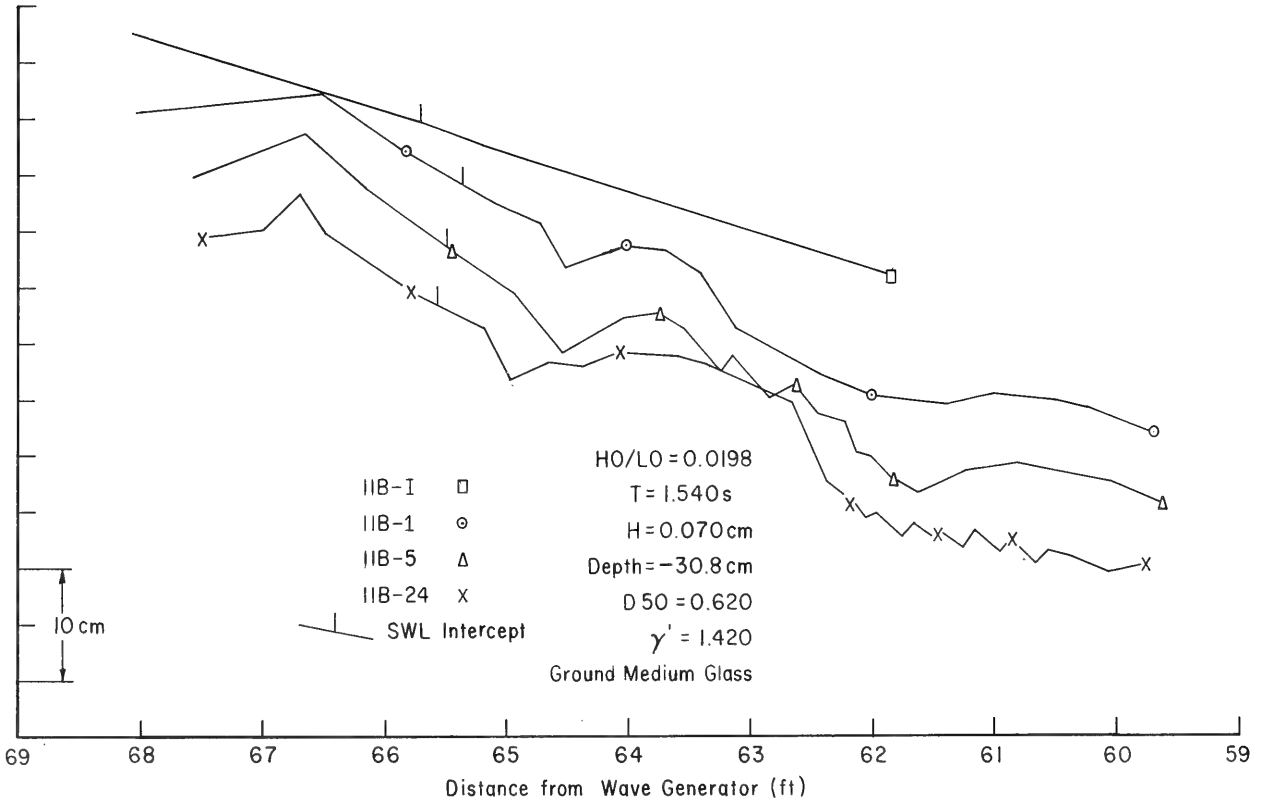

HO/LO = 0.0214
T = 1.540 s
H = 0.075 cm
Depth = −30.8 cm
D50 = 0.620
γ' = 1.420
Ground Medium Glass
6B-I
6B-1
6B-5
6B-24
SWL Intercept
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

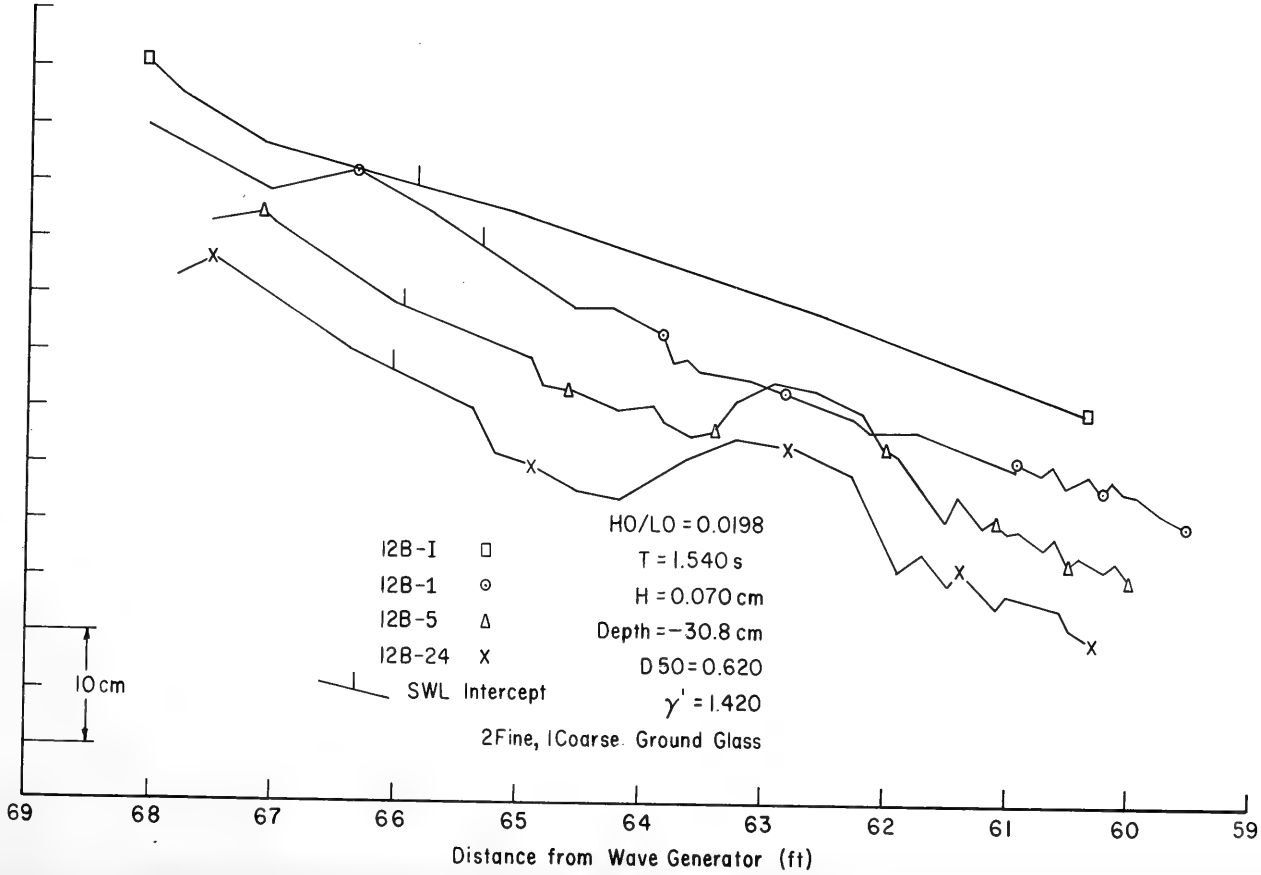

78-I
78-1
78-5
78-22
SWL Intercept
10 cm
H0/L0 = 0.0552
T = 1.000 s
H = 0.079 cm
Depth = −30.8 cm
D 50 = 0.620
γ' = 1.420
2 Fine, 1 Coarse Ground Glass
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

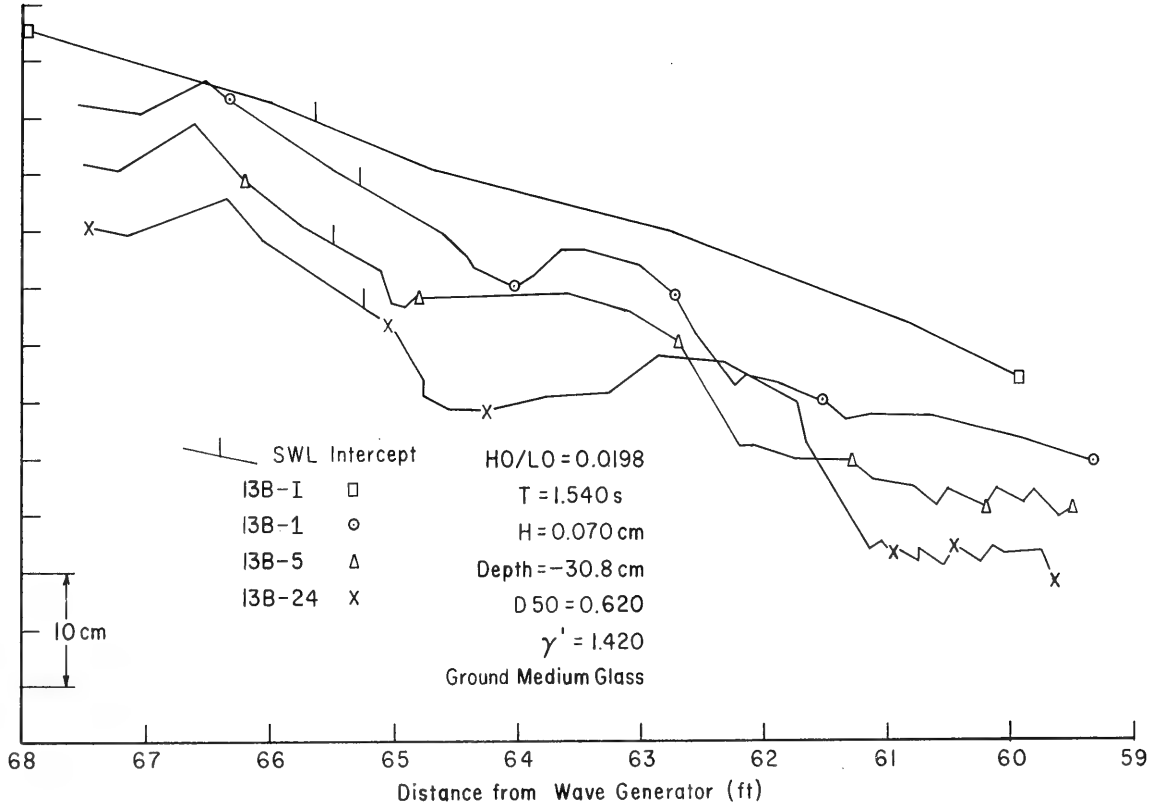

H0/L0 = 0.0552
T = 1.000 s
H = 0.079 cm
Depth = −30.8 cm
D50 = 0.620
γ' = 1.420
Ground Medium Glass
8B-I
8B-1
8B-5
8B-23
SWL Intercept
10 cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

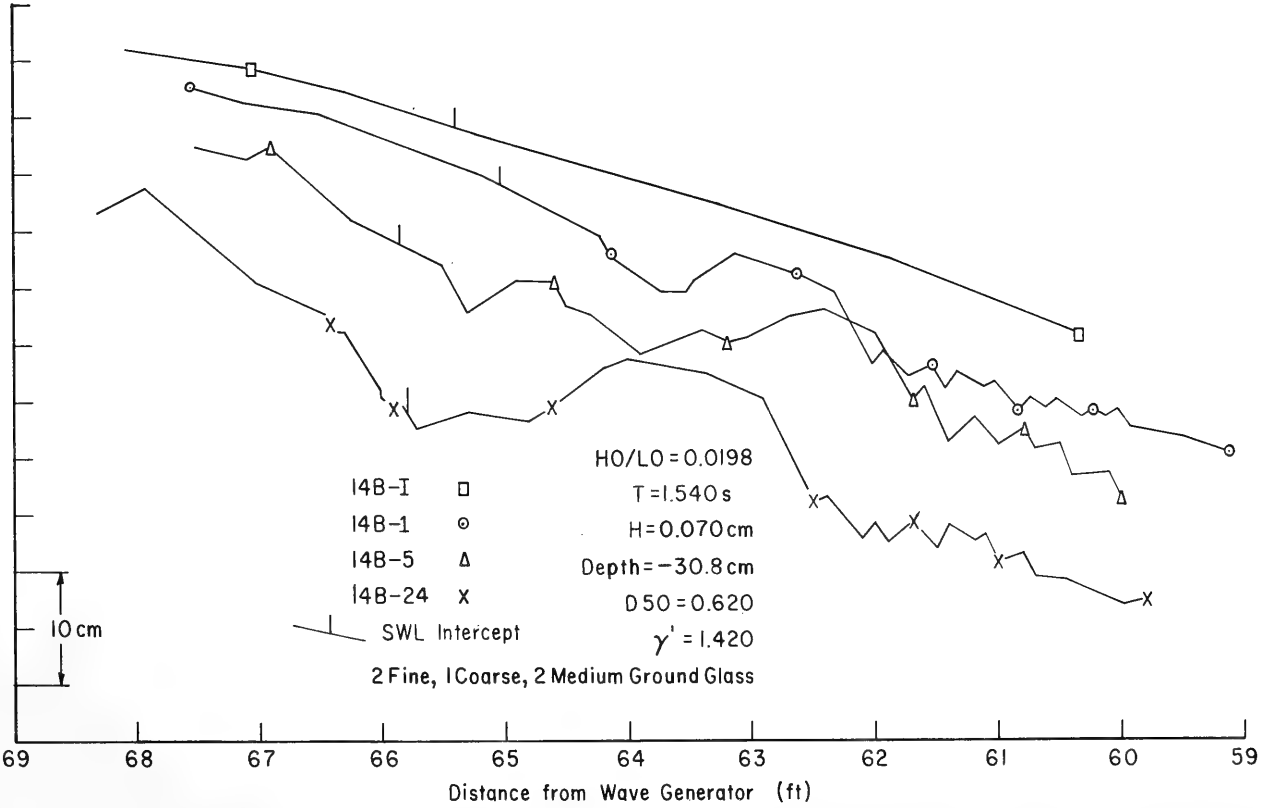

SWL Intercept
9B-I □
9B-1 o
9B-5 Δ
9B-24 X
H0/L0 = 0.0311
T = 1.260s
H = 0.071cm
Depth = −30.8cm
D50 = 0.620
γ' = 1.420
2Fine, 1Coarse Ground Glass
10cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft).

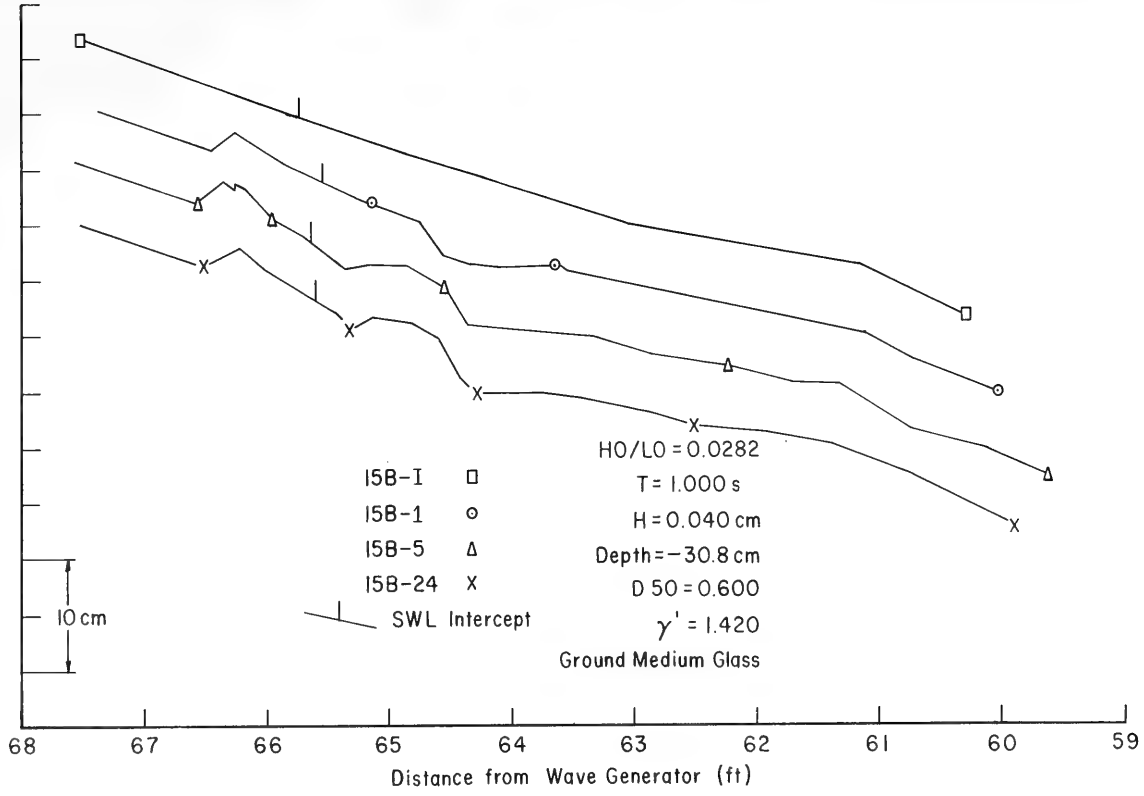

10B-I
10B-1
10B-5
10B-24
SWL Intercept
H0/L0 = 0.0311
T = 1.260 s
H = 0.071 cm
Depth = −30.8 cm
D 50 = 0.620
γ' = 1.420
Ground Medium Glass
10 cm
69
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

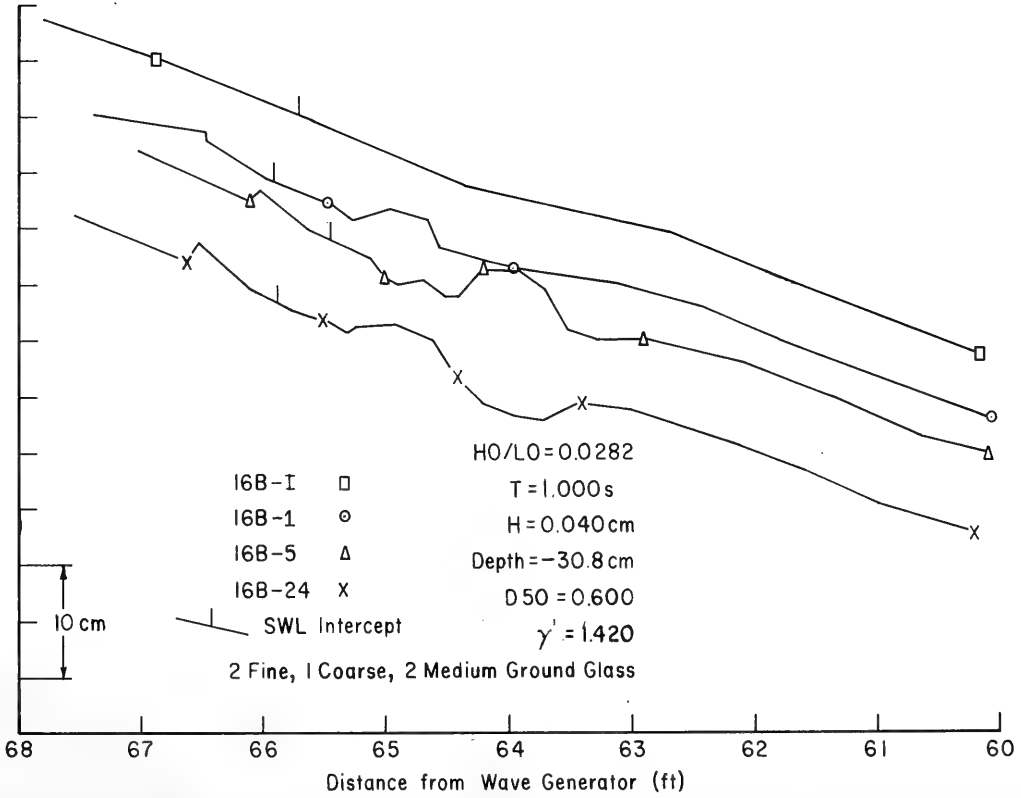

IIB-I
IIB-1
IIB-5
IIB-24
SWL Intercept
H0/L0 = 0.0198
T = 1.540s
H = 0.070cm
Depth = −30.8cm
D 50 = 0.620
γ' = 1.420
Ground Medium Glass
10 cm
69
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

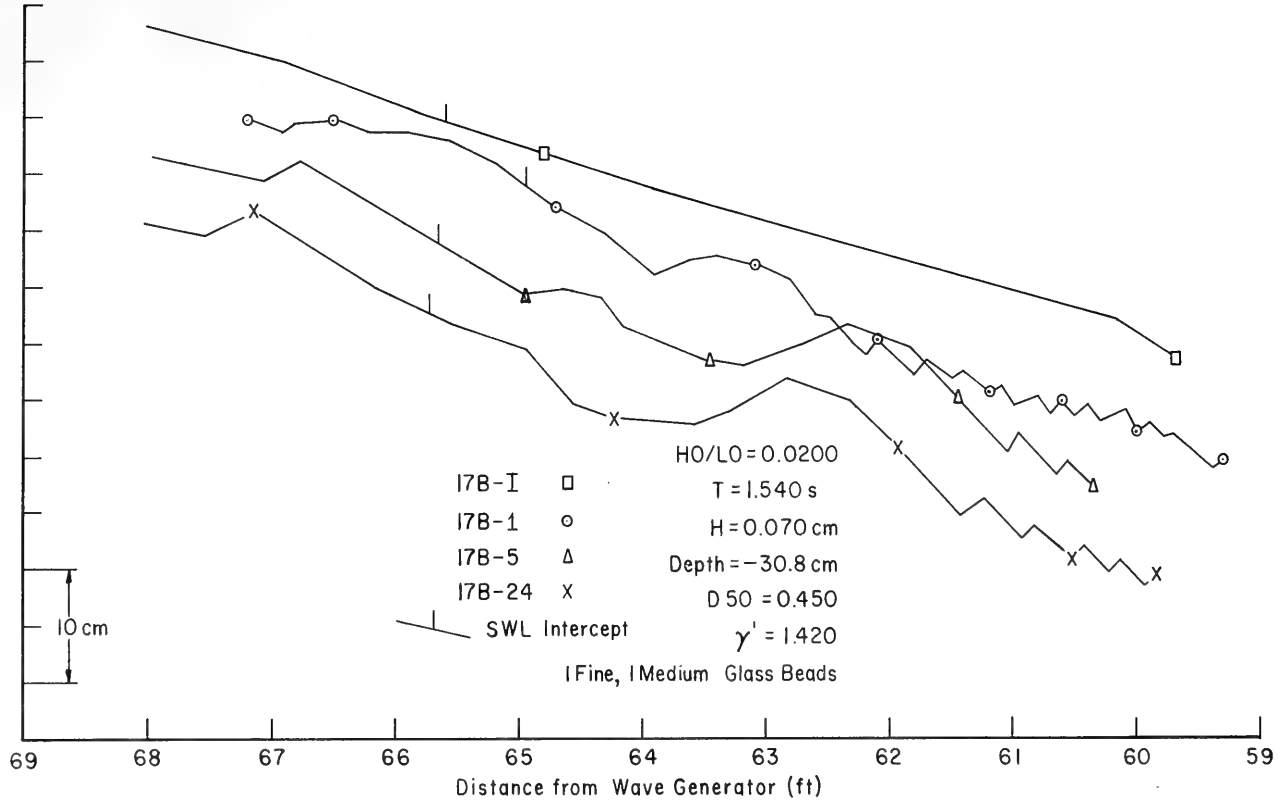

12B-I
12B-1
12B-5
12B-24
SWL Intercept
H0/L0 = 0.0198
T = 1.540 s
H = 0.070 cm
Depth = −30.8 cm
D 50 = 0.620
γ' = 1.420
2Fine, 1Coarse Ground Glass
10 cm
69
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

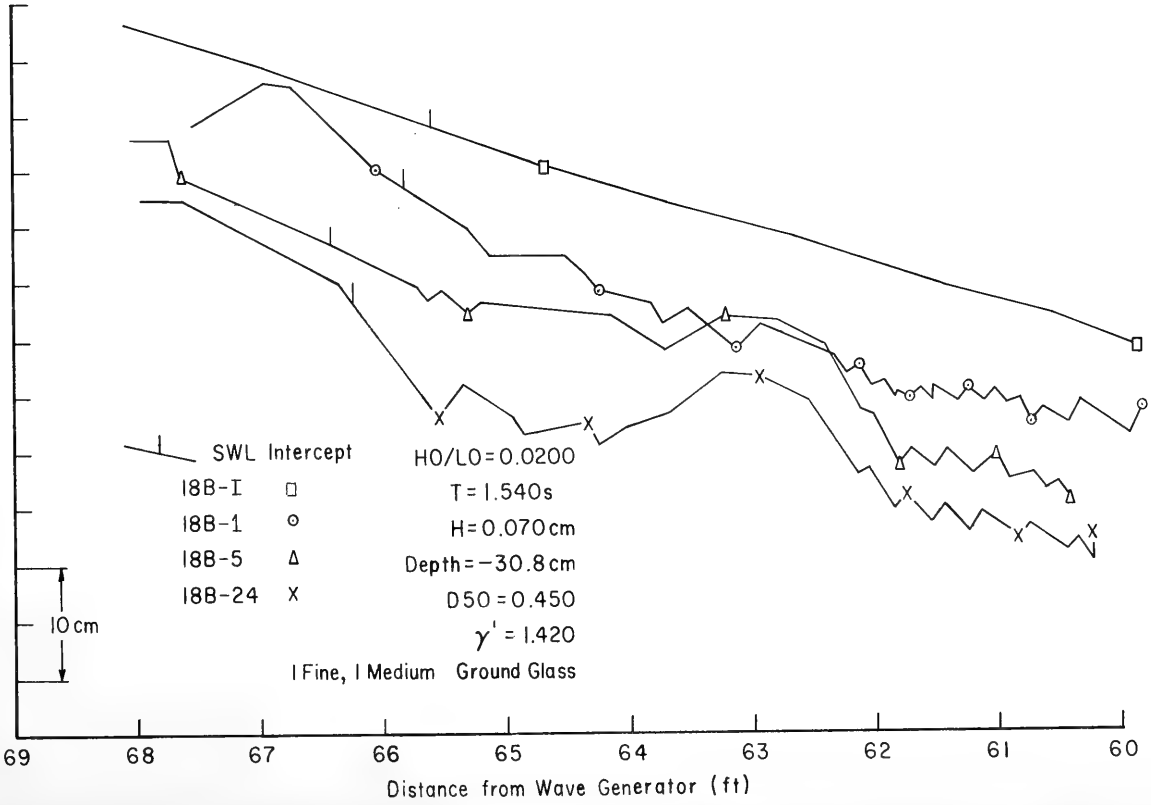

SWL Intercept
13B-I
13B-1
13B-5
13B-24
H0/L0 = 0.0198
T = 1.540 s
H = 0.070 cm
Depth = −30.8 cm
D 50 = 0.620
γ' = 1.420
Ground Medium Glass
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

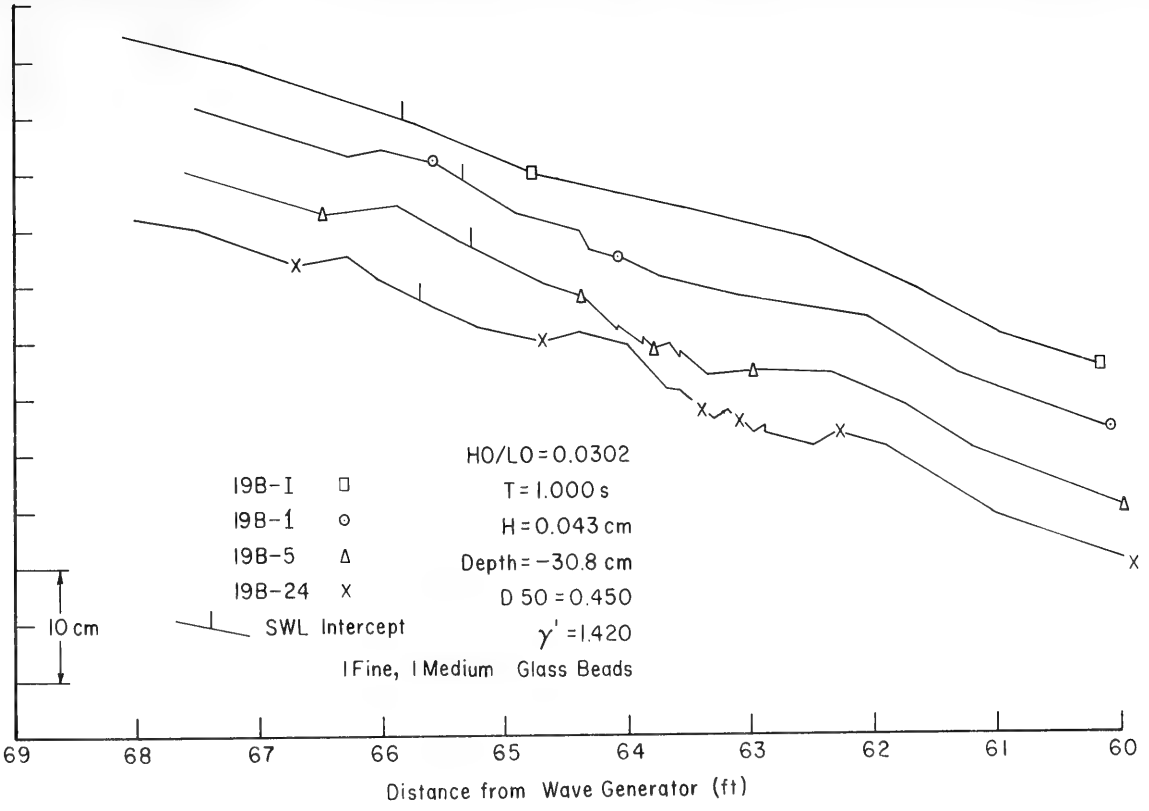

14B-I
14B-1
14B-5
14B-24
SWL Intercept
H0/L0 = 0.0198
T = 1.540 s
H = 0.070 cm
Depth = −30.8 cm
D50 = 0.620
γ' = 1.420
2 Fine, 1 Coarse, 2 Medium Ground Glass
10 cm
69
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

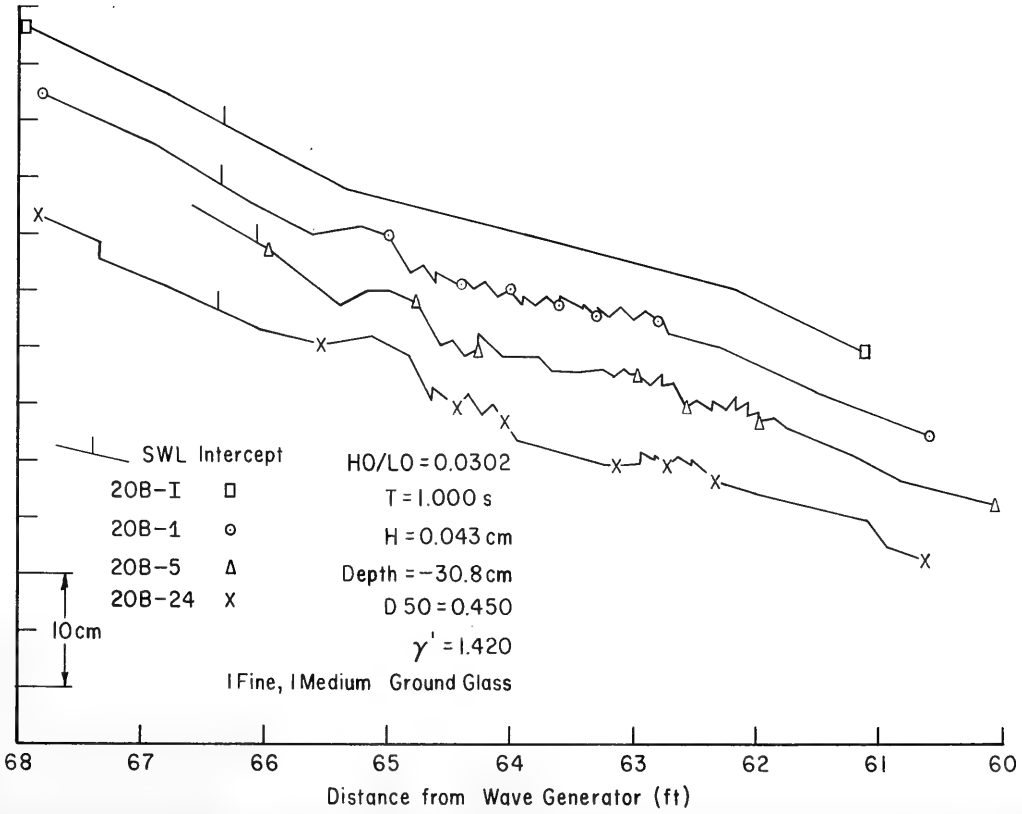

158-I
158-1
158-5
158-24
SWL Intercept
10 cm
H0/L0 = 0.0282
T = 1.000 s
H = 0.040 cm
Depth = −30.8 cm
D 50 = 0.600
γ' = 1.420
Ground Medium Glass
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

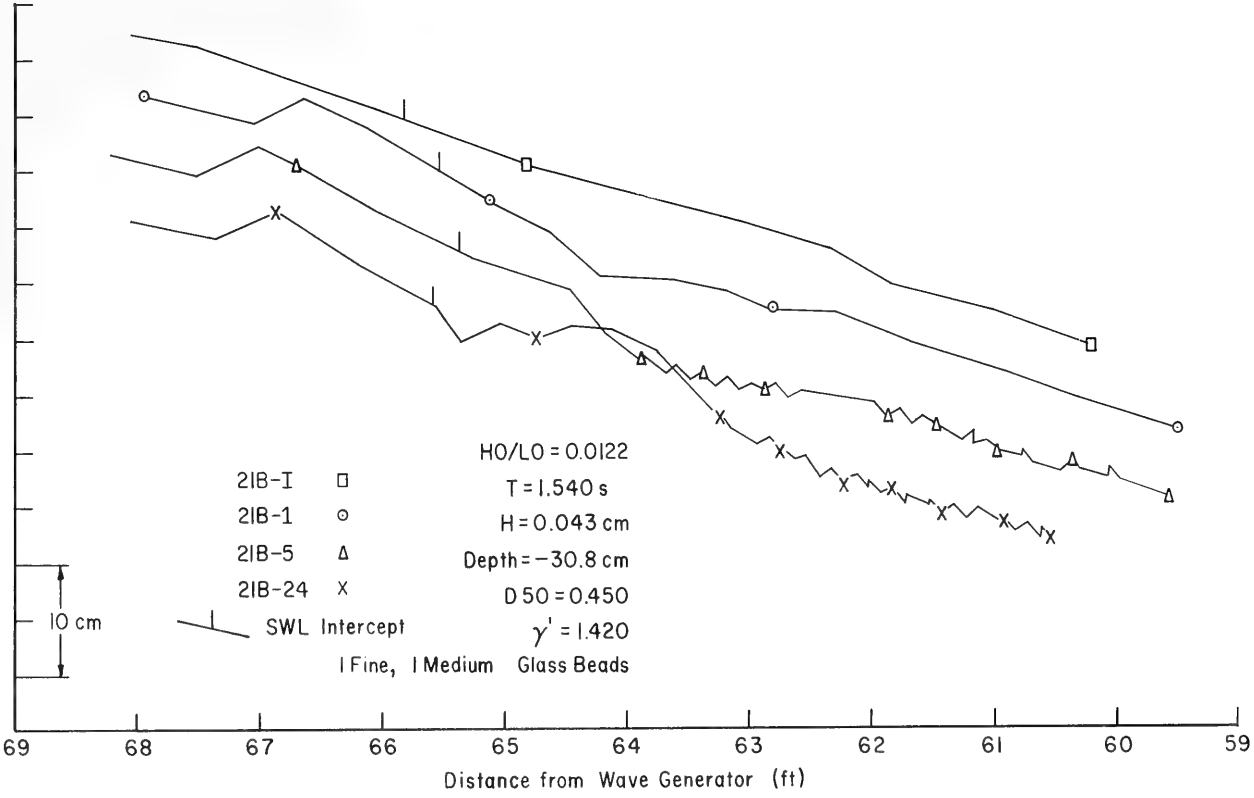

H0/L0 = 0.0282
T = 1.000 s
H = 0.040 cm
Depth = −30.8 cm
D50 = 0.600
γ' = 1.420
16B-I
16B-1
16B-5
16B-24
SWL Intercept
2 Fine, 1 Coarse, 2 Medium Ground Glass
10 cm
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

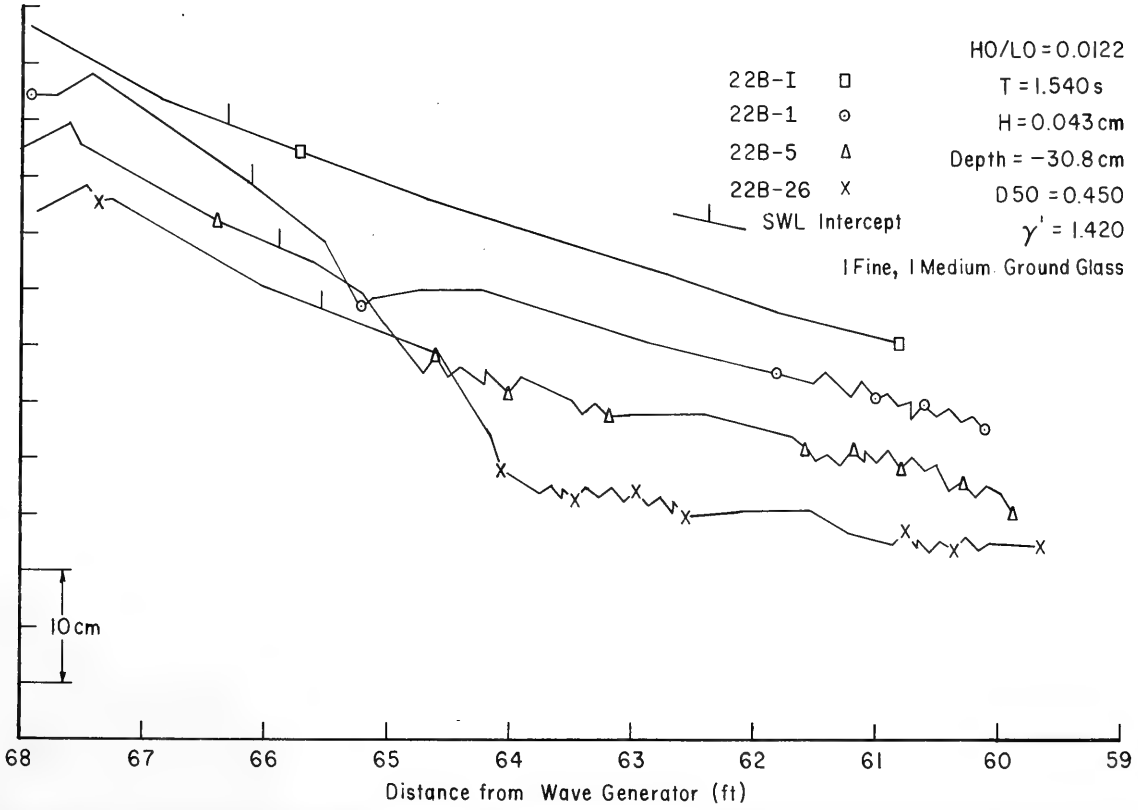

17B-I
17B-1
17B-5
17B-24
SWL Intercept
H0/L0 = 0.0200
T = 1.540 s
H = 0.070 cm
Depth = −30.8 cm
D 50 = 0.450
γ' = 1.420
1 Fine, 1 Medium Glass Beads
10 cm
69
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

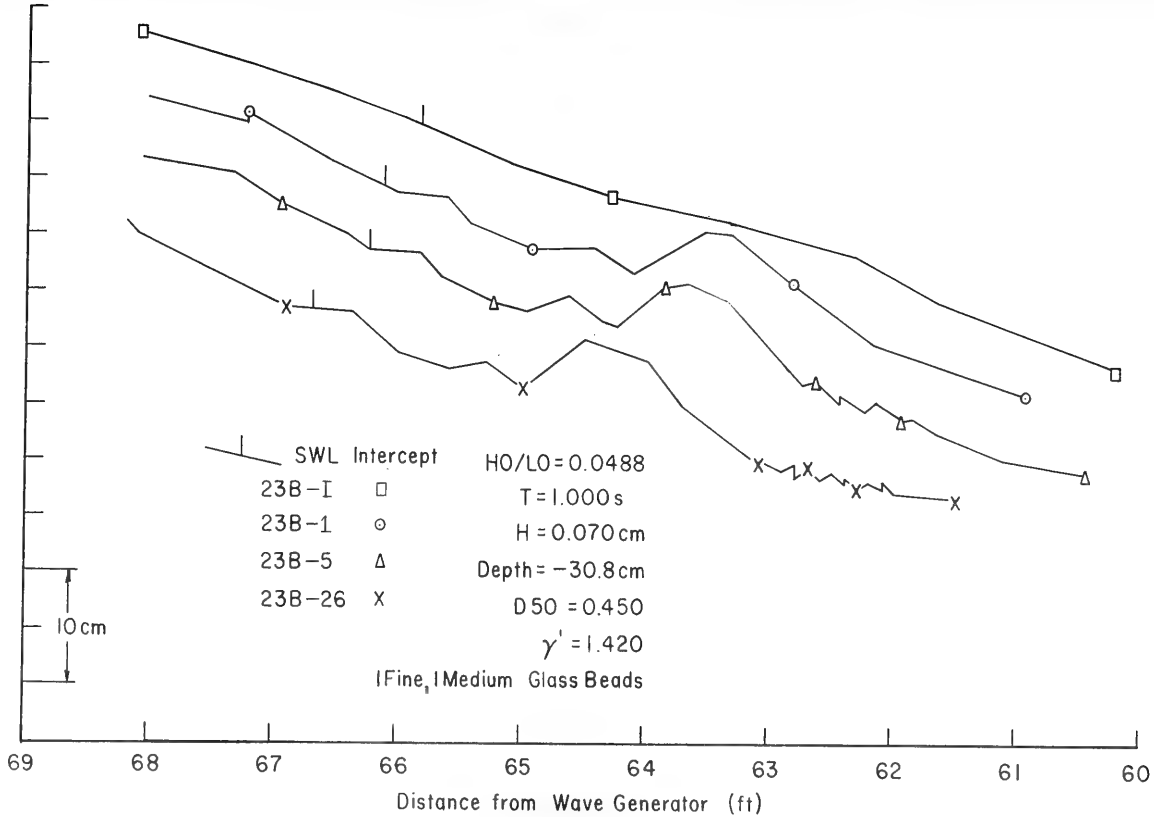

SWL Intercept
18B-I
18B-1
18B-5
18B-24
H0/L0=0.0200
T=1.540s
H=0.070cm
Depth=−30.8cm
D50=0.450
γ' = 1.420
1 Fine, 1 Medium Ground Glass
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

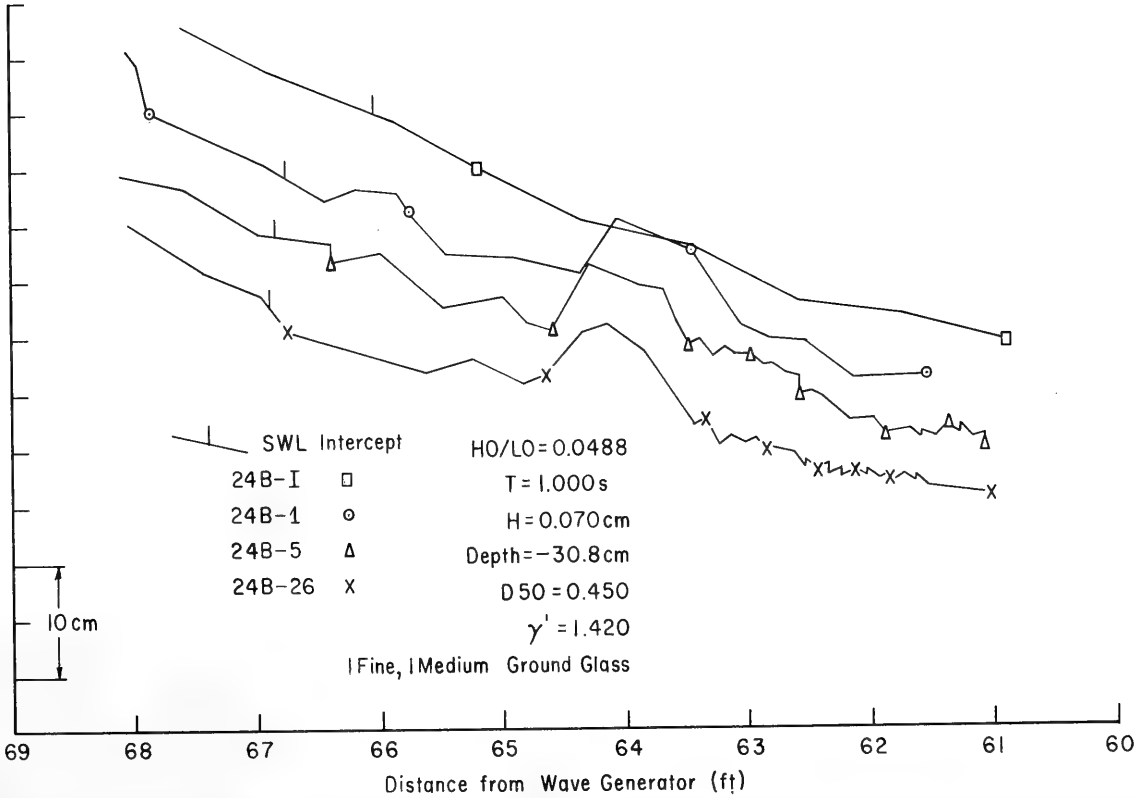

H0/L0 = 0.0302
T = 1.000 s
H = 0.043 cm
Depth = −30.8 cm
D 50 = 0.450
γ' = 1.420
1 Fine, 1 Medium Glass Beads
19B-I
19B-1
19B-5
19B-24
SWL Intercept
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

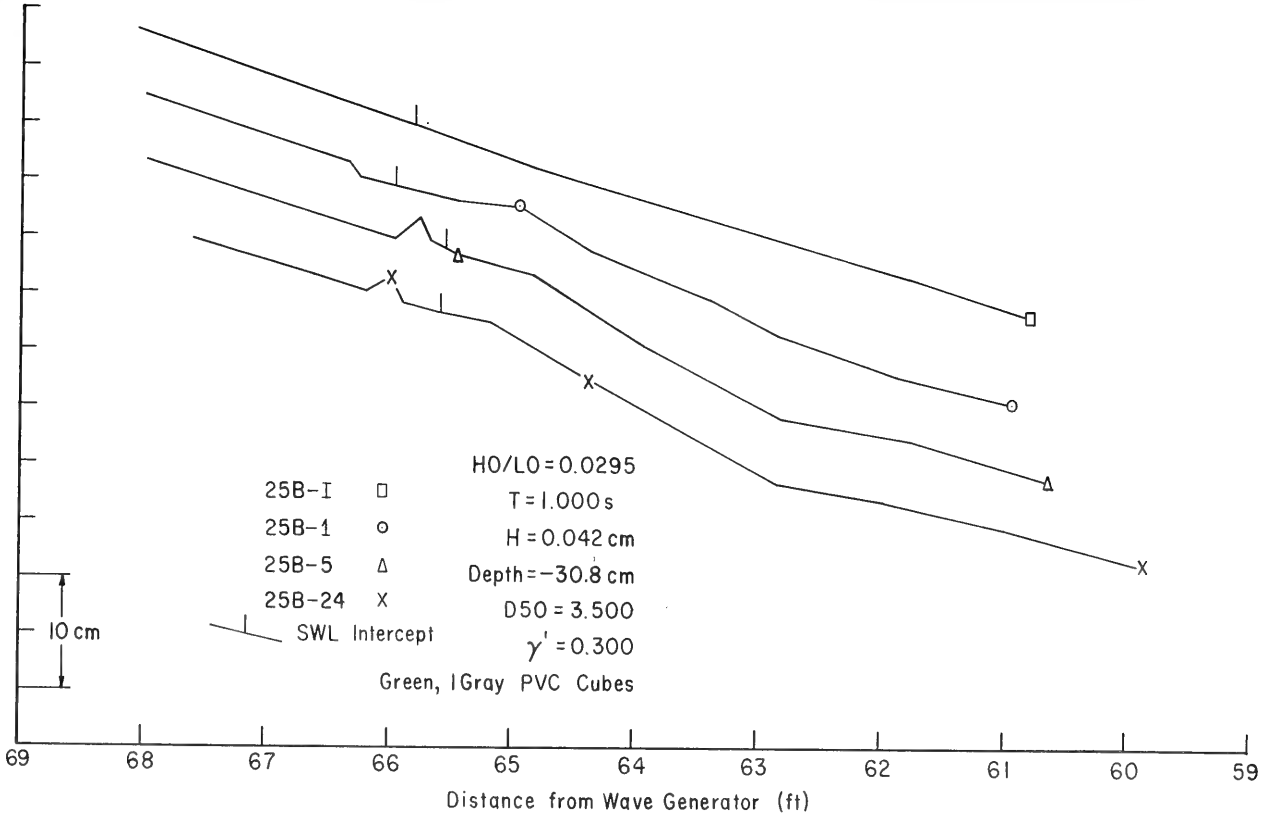

SWL Intercept
20B-I
20B-1
20B-5
20B-24
10cm
H0/L0 = 0.0302
T = 1.000 s
H = 0.043 cm
Depth = −30.8 cm
D 50 = 0.450
γ' = 1.420
1 Fine, 1 Medium Ground Glass
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

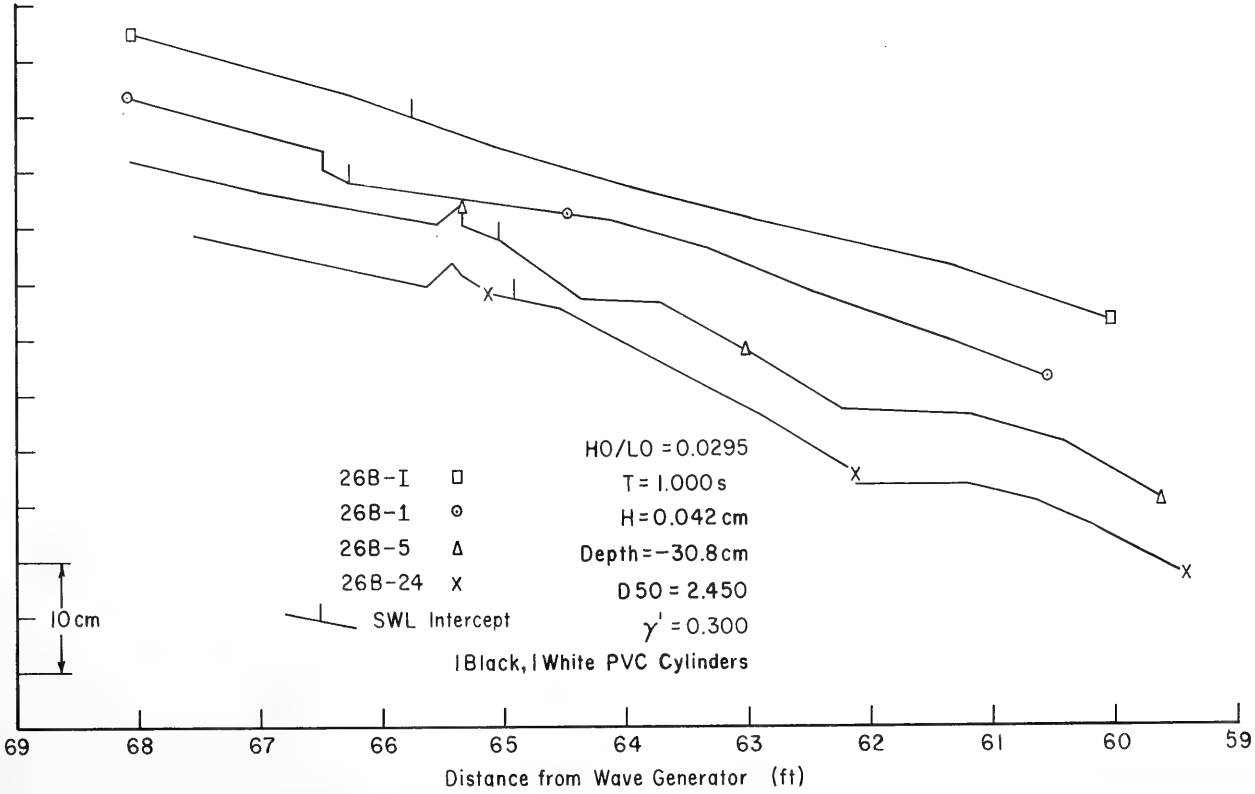

HO/LO = 0.0122
T = 1.540 s
H = 0.043 cm
Depth = −30.8 cm
D 50 = 0.450
γ' = 1.420
1 Fine, 1 Medium Glass Beads
21B-I
21B-1
21B-5
21B-24
SWL Intercept
10 cm
69
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

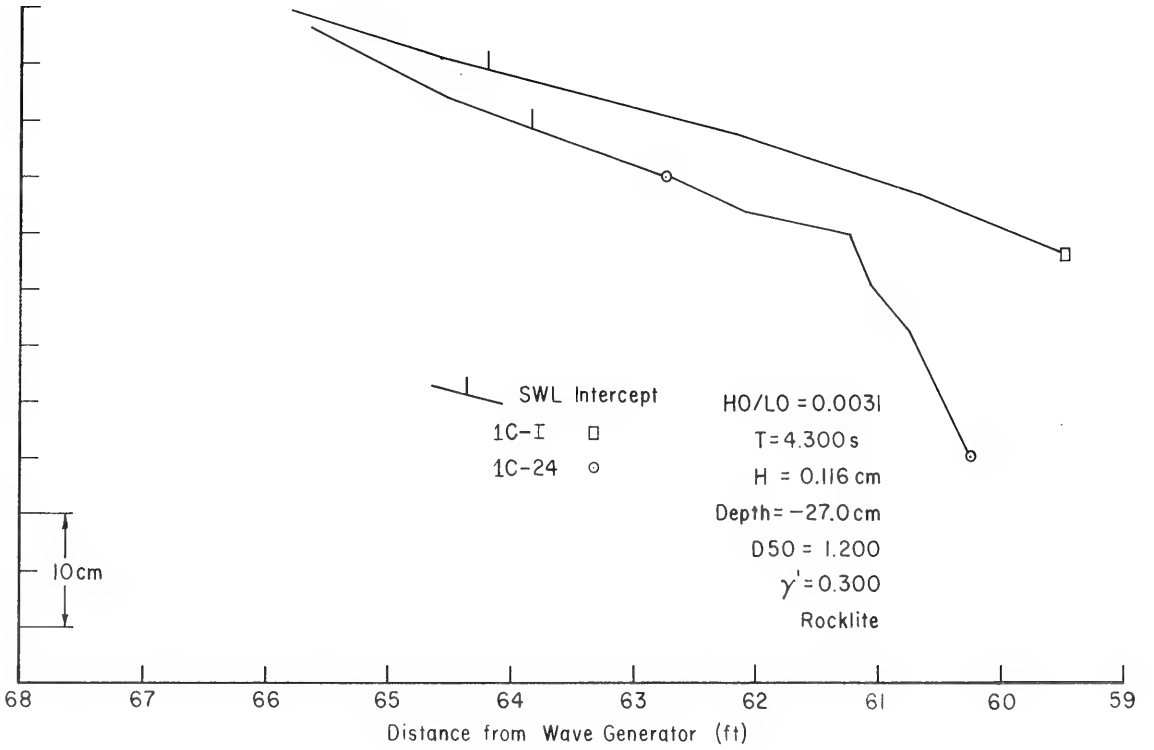

H0/L0 = 0.0122
T = 1.540 s
H = 0.043 cm
Depth = −30.8 cm
D50 = 0.450
γ' = 1.420
1 Fine, 1 Medium Ground Glass
22B-I
22B-1
22B-5
22B-26
SWL Intercept
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

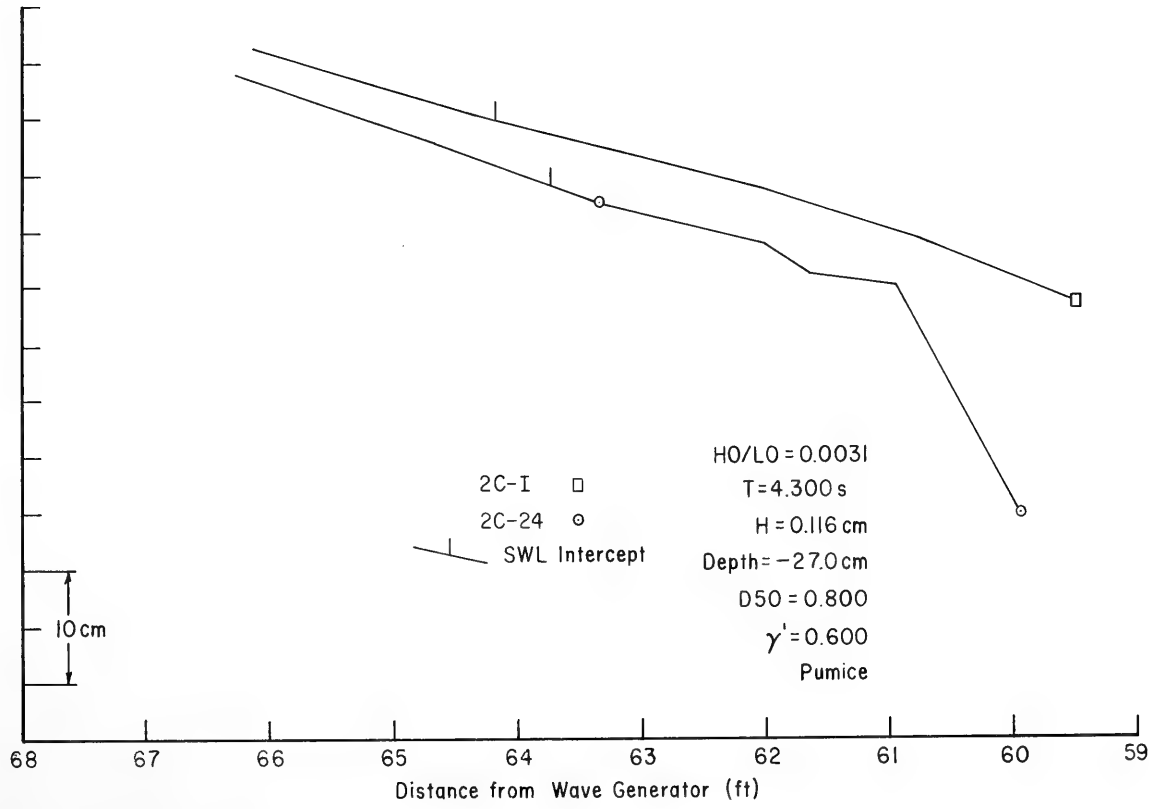

SWL Intercept
23B-I □
23B-1 ⊙
23B-5 Δ
23B-26 X
H0/L0 = 0.0488
T = 1.000 s
H = 0.070 cm
Depth = −30.8 cm
D50 = 0.450
γ' = 1.420
1 Fine, 1 Medium Glass Beads
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

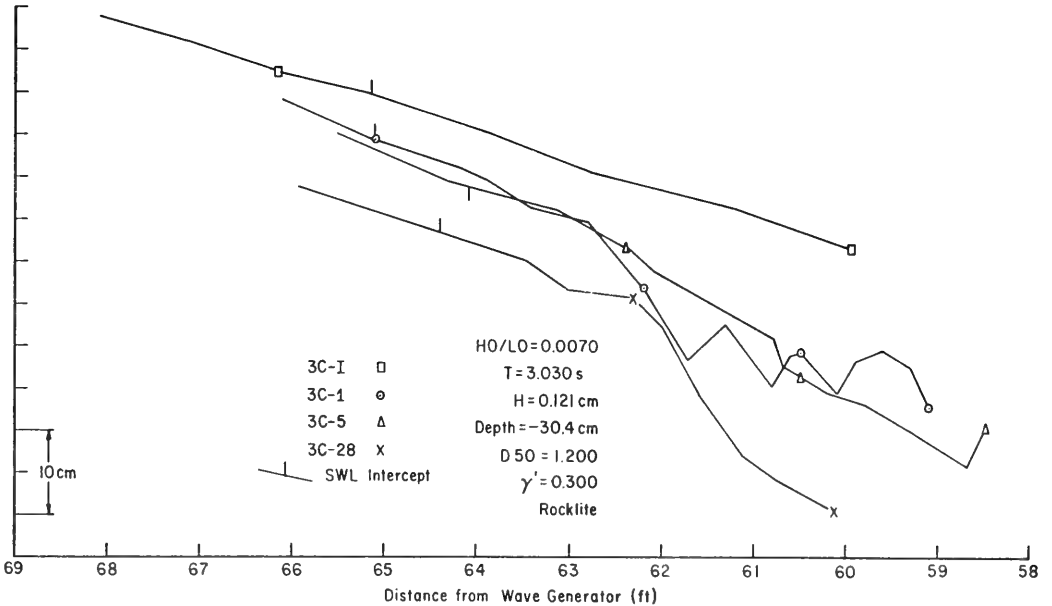

SWL Intercept
24B-I
24B-1
24B-5
24B-26
HO/LO = 0.0488
T = 1.000 s
H = 0.070 cm
Depth = −30.8 cm
D50 = 0.450
γ' = 1.420
1 Fine, 1 Medium Ground Glass
10 cm
69
68
67
66
65
64
63
62
61
60
Distance from Wave Generator (ft)

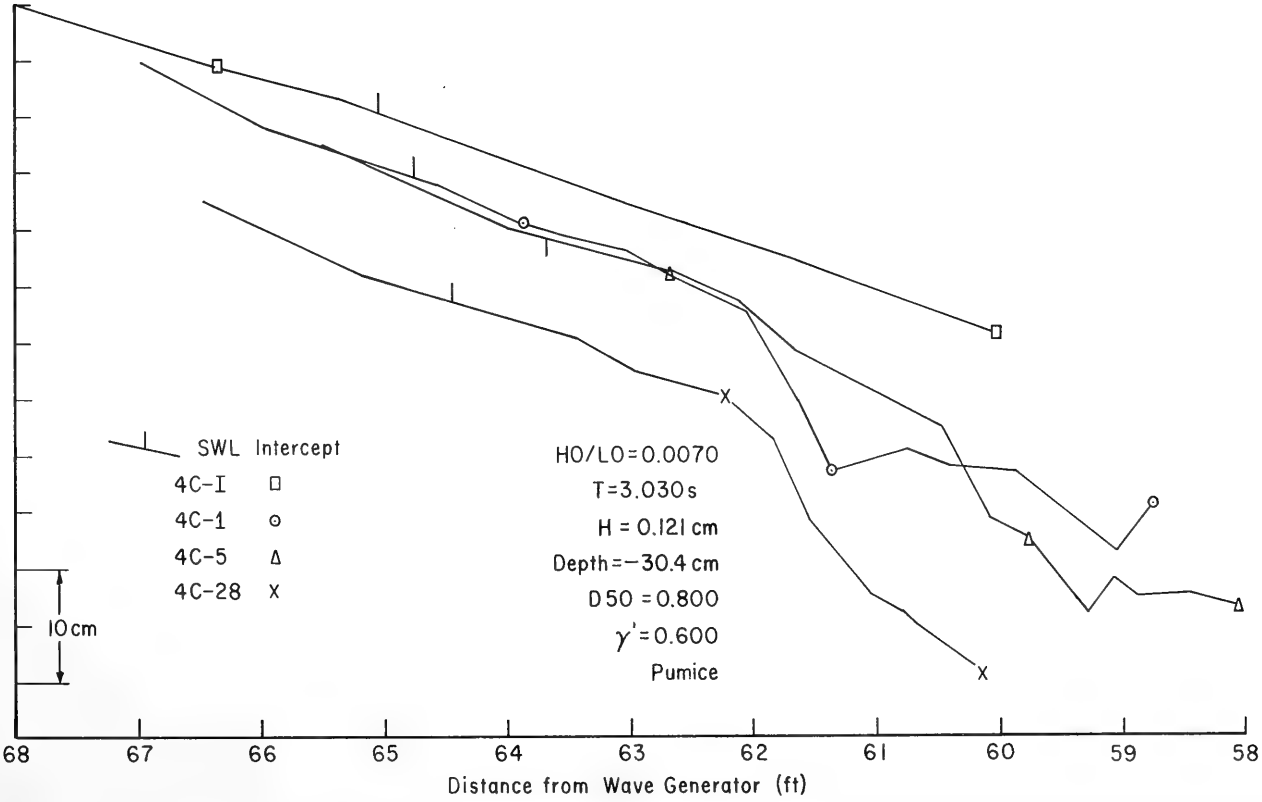

25B-I
25B-1
25B-5
25B-24
SWL Intercept
H0/L0 = 0.0295
T = 1.000 s
H = 0.042 cm
Depth = −30.8 cm
D50 = 3.500
γ' = 0.300
Green, 1Gray PVC Cubes
10 cm
69
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

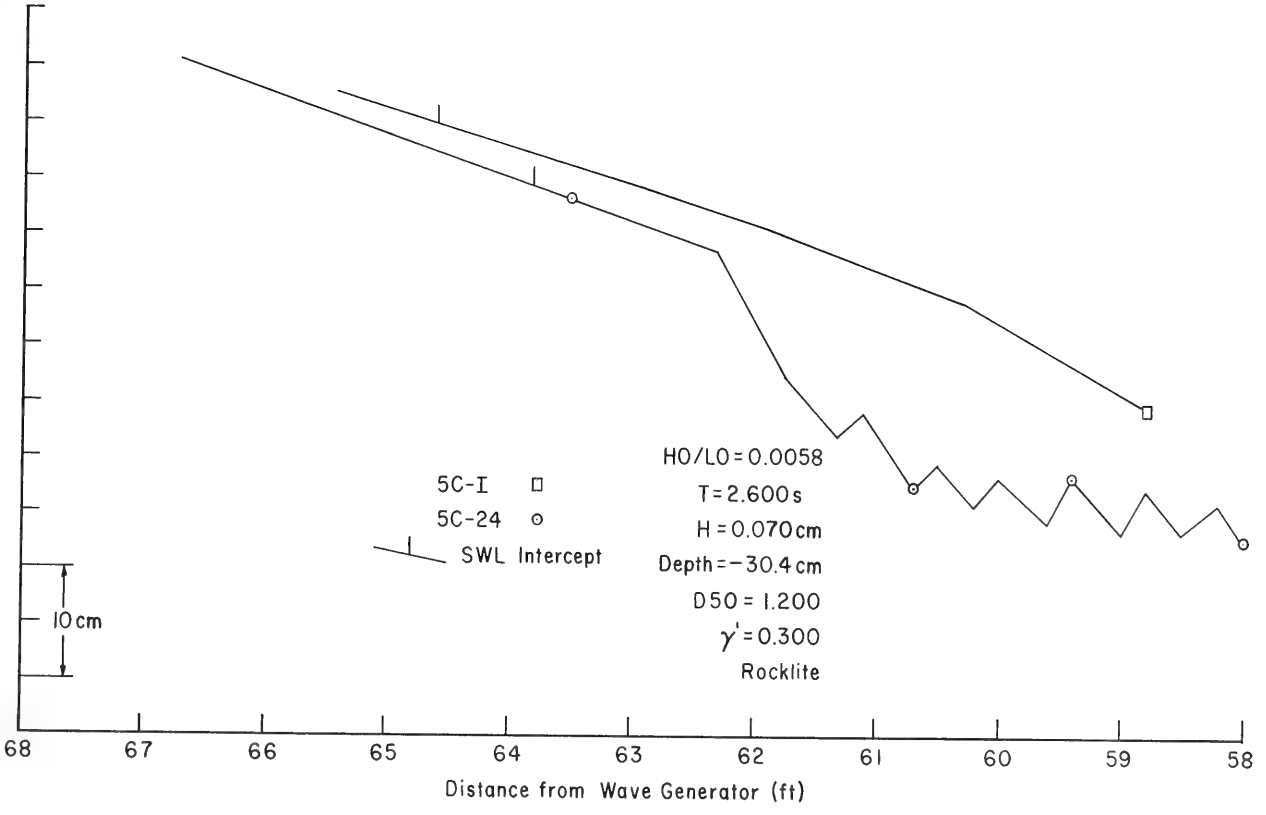

26B-I
26B-1
26B-5
26B-24
SWL Intercept
H0/L0 = 0.0295
T = 1.000 s
H = 0.042 cm
Depth = −30.8 cm
D50 = 2.450
γ' = 0.300
1 Black, 1 White PVC Cylinders
10 cm
69
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

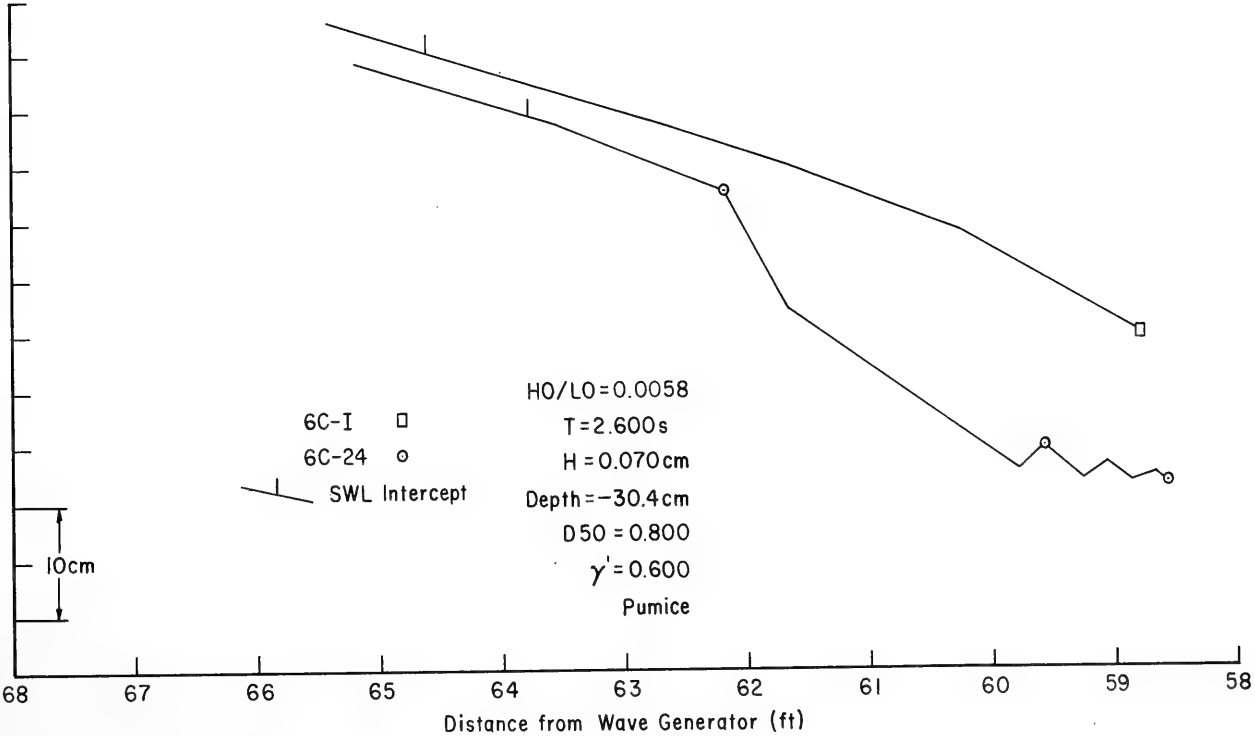

SWL Intercept
1C-I
1C-24
H0/L0 = 0.0031
T = 4.300 s
H = 0.116 cm
Depth = −27.0 cm
D50 = 1.200
γ' = 0.300
Rocklite
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

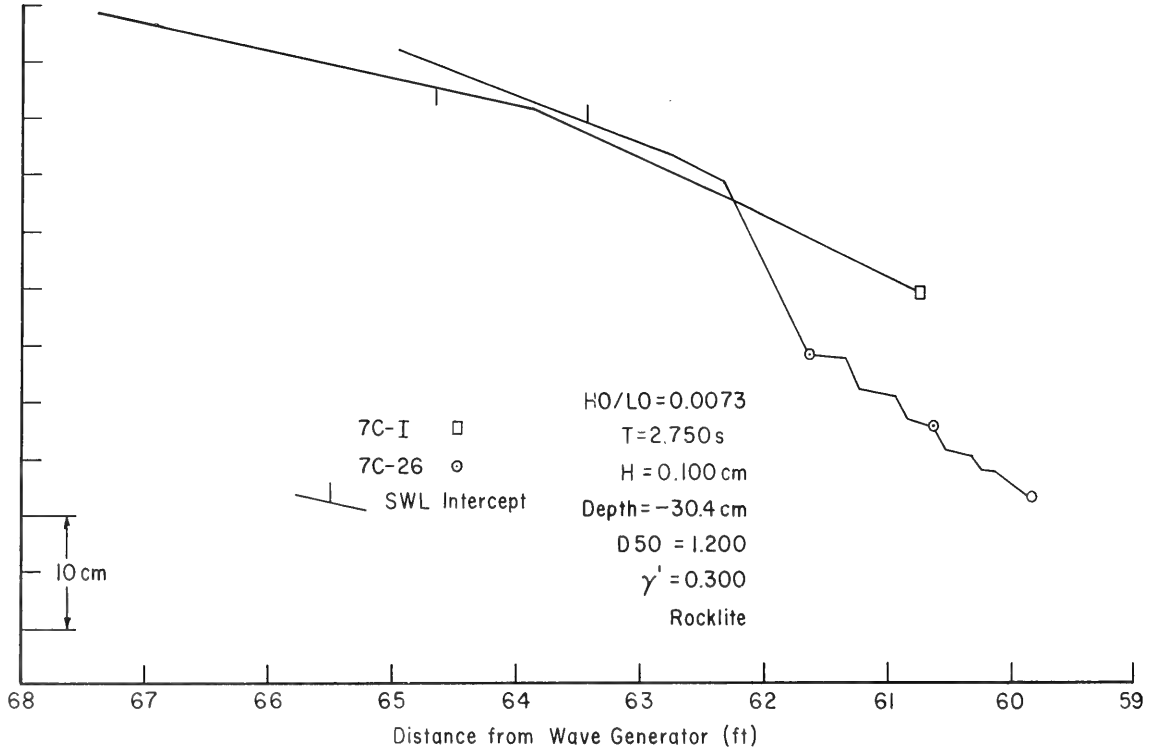

2C-I
2C-24
SWL Intercept
H0/L0 = 0.0031
T=4.300 s
H = 0.116 cm
Depth= −27.0 cm
D50 = 0.800
γ' = 0.600
Pumice
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

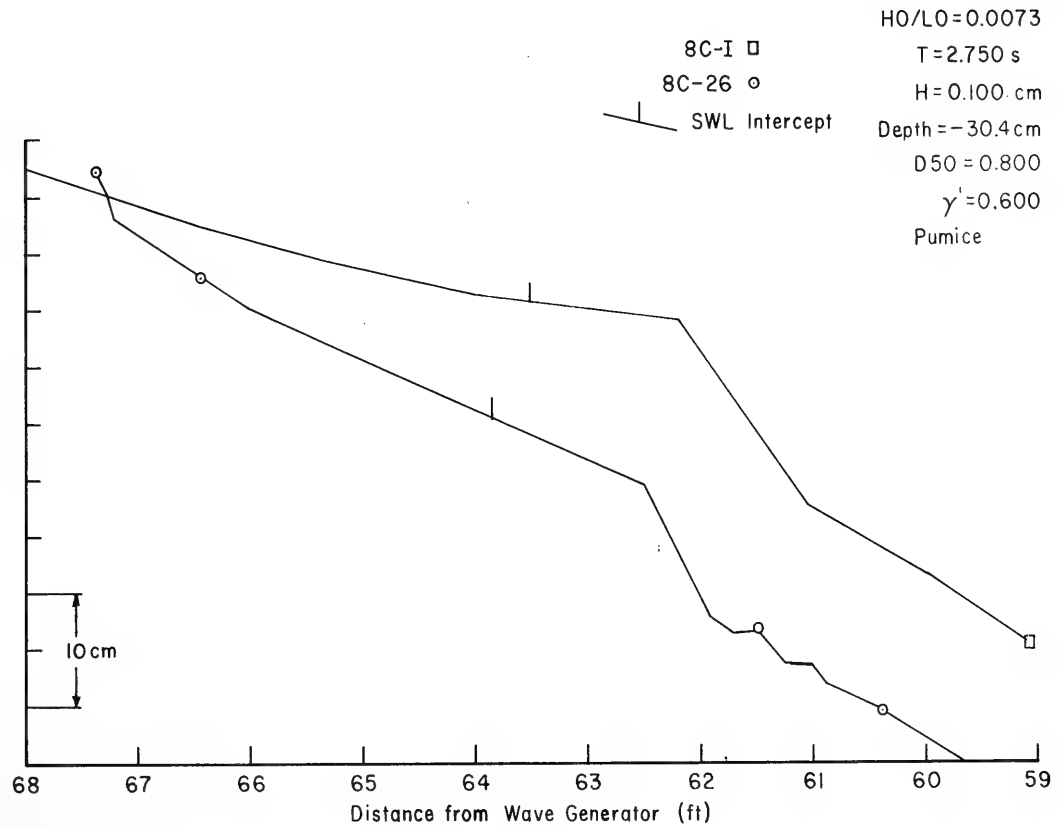

3C-I □
3C-1 o
3C-5 Δ
3C-28 X
SWL Intercept
H0/L0=0.0070
T=3.030 s
H=0.121 cm
Depth=−30.4 cm
D 50 = 1.200
γ'=0.300
Rocklite
10cm
69
68
67
66
65
64
63
62
61
60
59
58
Distance from Wave Generator (ft)

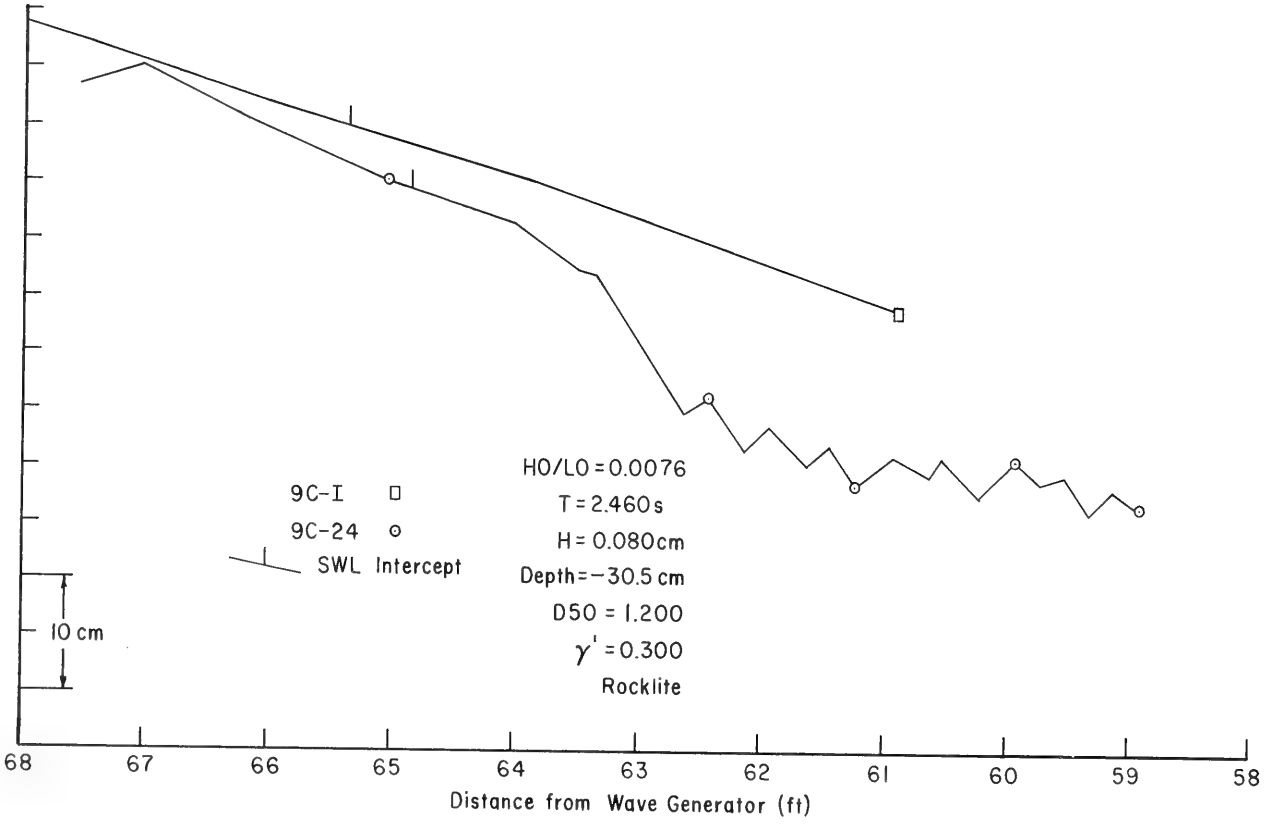

SWL Intercept
4C-I □
4C-1 ○
4C-5 Δ
4C-28 X
10 cm
H0/L0=0.0070
T=3.030 s
H = 0.121 cm
Depth=−30.4 cm
D50 =0.800
γ'=0.600
Pumice
68
67
66
65
64
63
62
61
60
59
58
Distance from Wave Generator (ft)

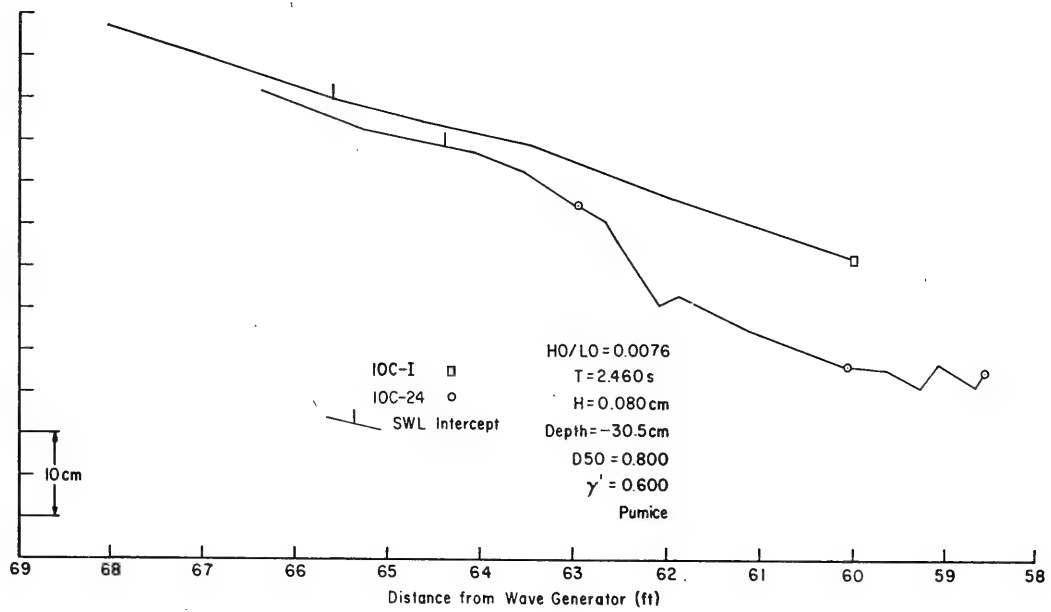

5C-I
5C-24
SWL Intercept
H0/L0 = 0.0058
T = 2.600 s
H = 0.070 cm
Depth = −30.4 cm
D50 = 1.200
γ' = 0.300
Rocklite
10 cm
68
67
66
65
64
63
62
61
60
59
58
Distance from Wave Generator (ft)

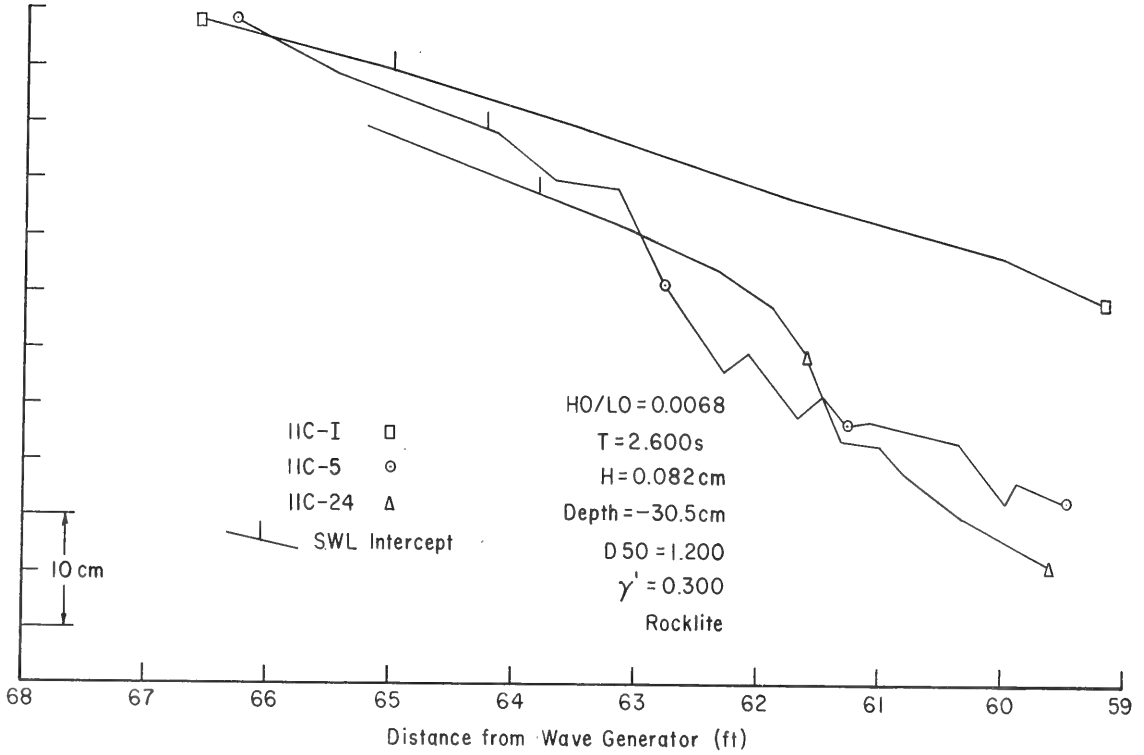

6C-I
6C-24
SWL Intercept
H0/L0 = 0.0058
T = 2.600 s
H = 0.070 cm
Depth = −30.4 cm
D50 = 0.800
γ' = 0.600
Pumice
10cm
68
67
66
65
64
63
62
61
60
59
58
Distance from Wave Generator (ft)

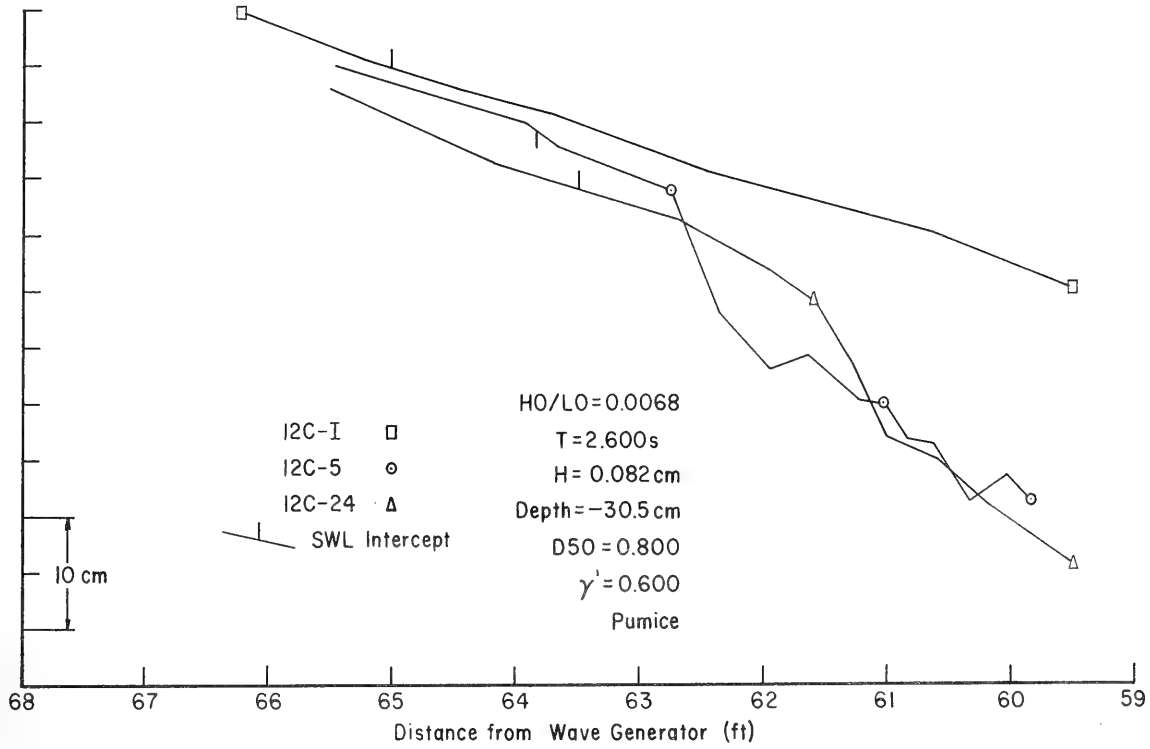

7C-I
7C-26
SWL Intercept
H0/L0=0.0073
T=2.750s
H=0.100cm
Depth=-30.4cm
D50 =1.200
γ' =0.300
Rocklite
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

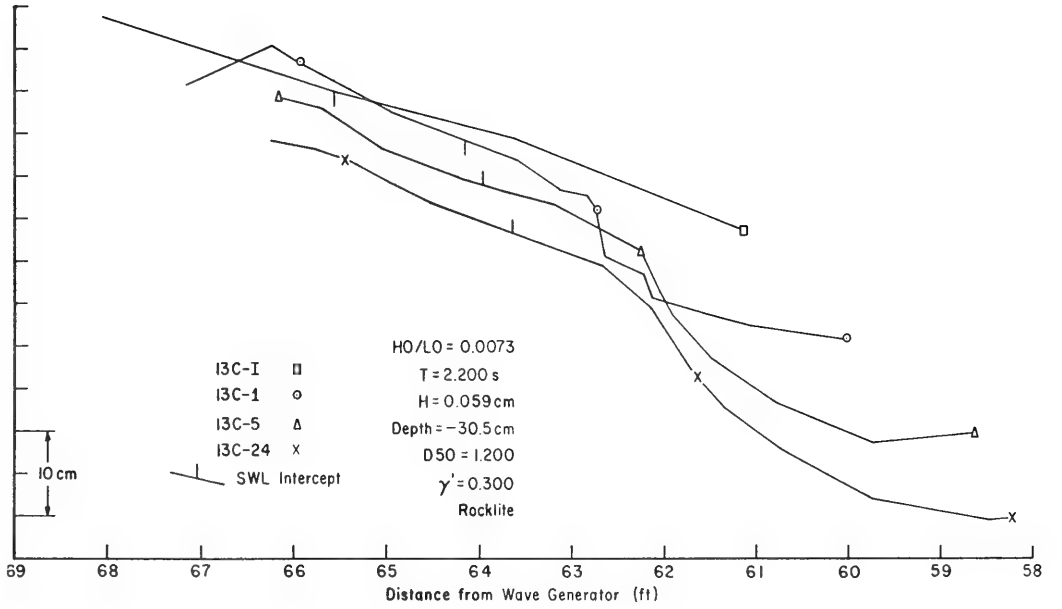

8C-I □
8C-26 o
SWL Intercept
H0/L0=0.0073
T=2.750 s
H=0.100 cm
Depth=−30.4 cm
D50=0.800
γ'=0.600
Pumice
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

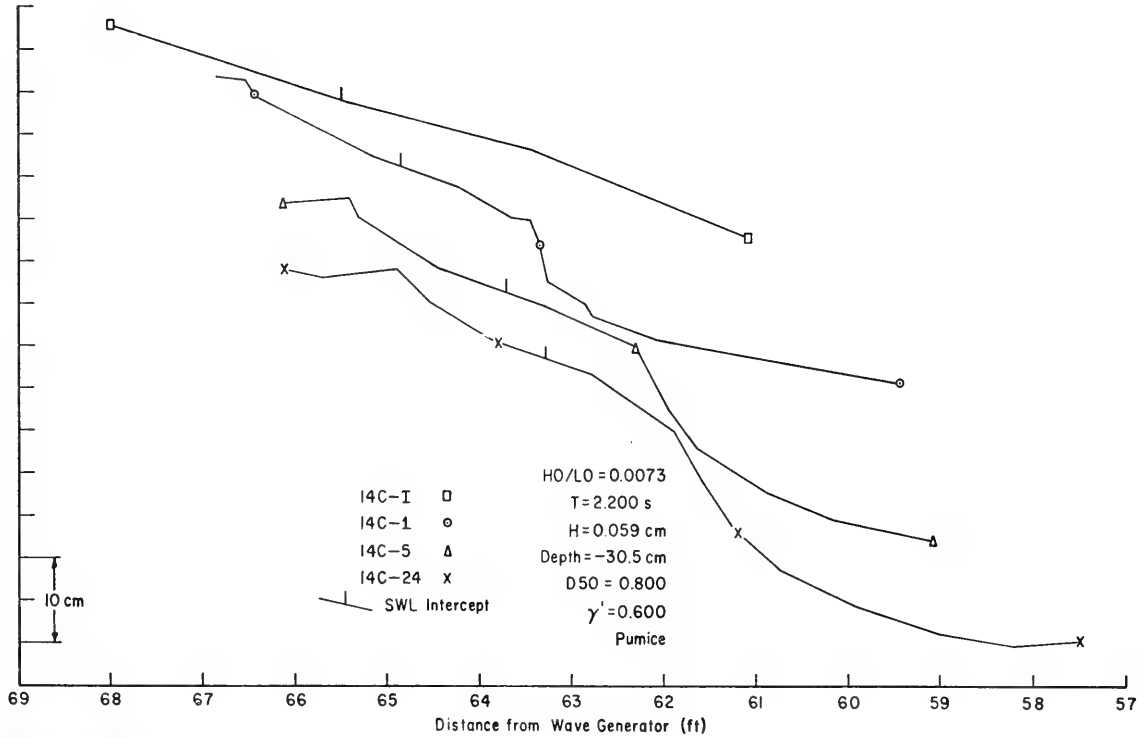

9C-I
9C-24
SWL Intercept
10 cm
H0/L0 = 0.0076
T = 2.460 s
H = 0.080 cm
Depth = −30.5 cm
D50 = 1.200
γ' = 0.300
Rocklite
68
67
66
65
64
63
62
61
60
59
58
Distance from Wave Generator (ft)

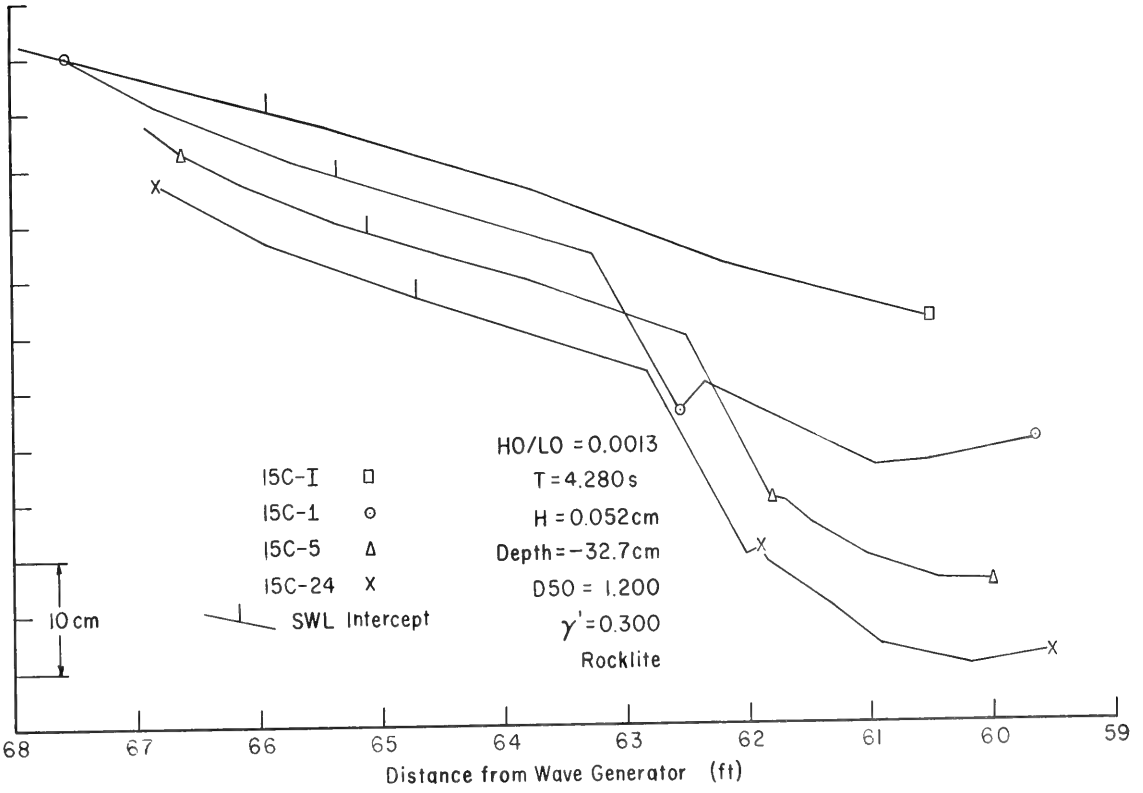

10C-I
10C-24
SWL Intercept
H0/L0 = 0.0076
T = 2.460 s
H = 0.080 cm
Depth = −30.5 cm
D50 = 0.800
γ' = 0.600
Pumice
10 cm
69
68
67
66
65
64
63
62
61
60
59
58
Distance from Wave Generator (ft)

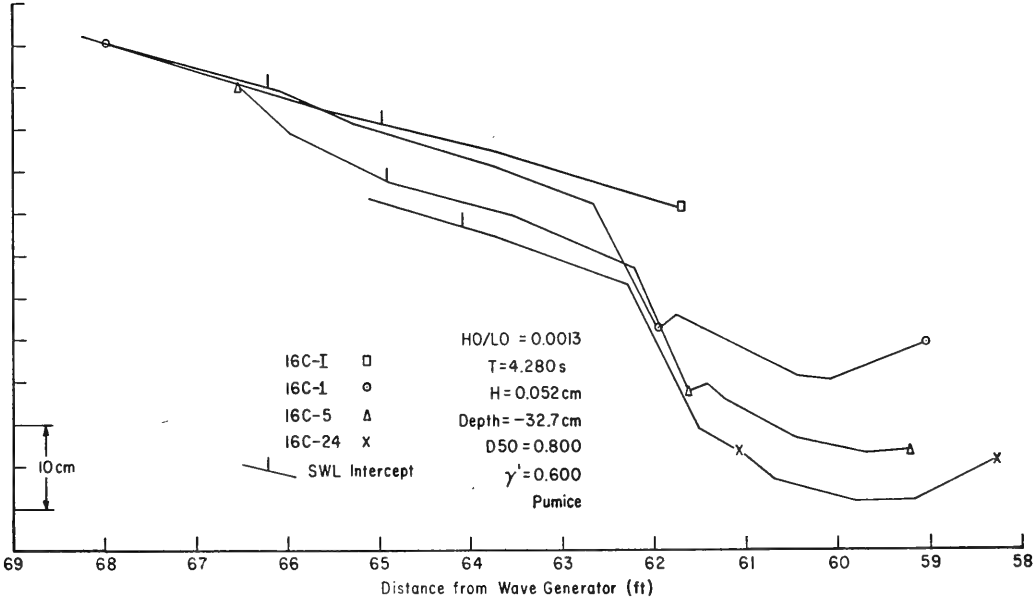

IIC-I
IIC-5
IIC-24
SWL Intercept
H0/L0 = 0.0068
T = 2.600s
H = 0.082cm
Depth = −30.5cm
D 50 = 1.200
γ' = 0.300
Rocklite
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

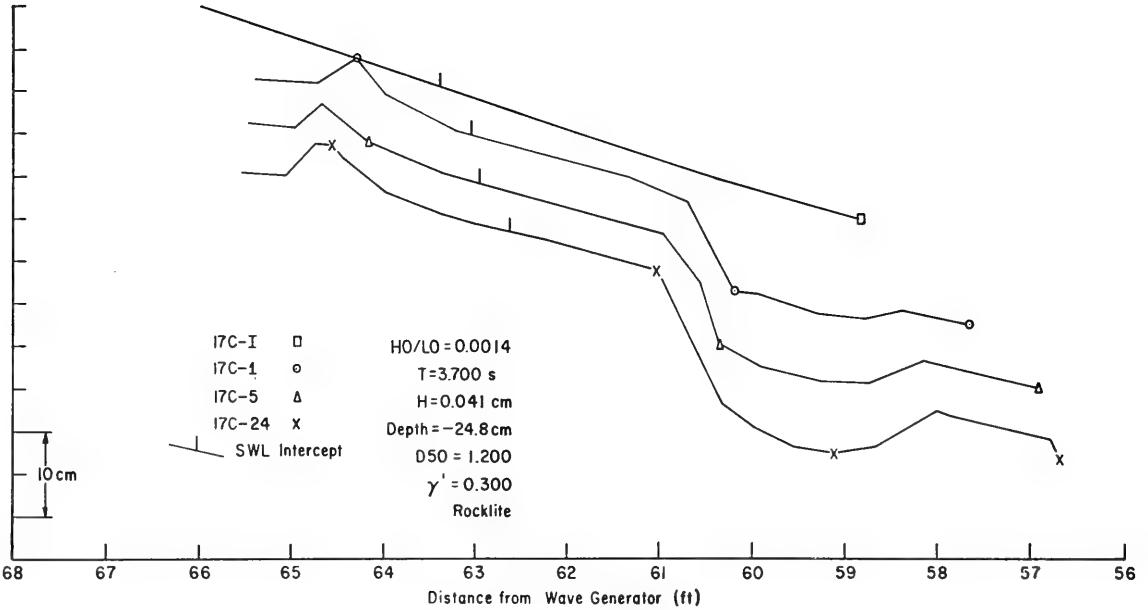

12C-I
12C-5
12C-24
SWL Intercept
H0/L0=0.0068
T=2.600s
H= 0.082cm
Depth=−30.5cm
D50=0.800
γ'=0.600
Pumice
10 cm
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)

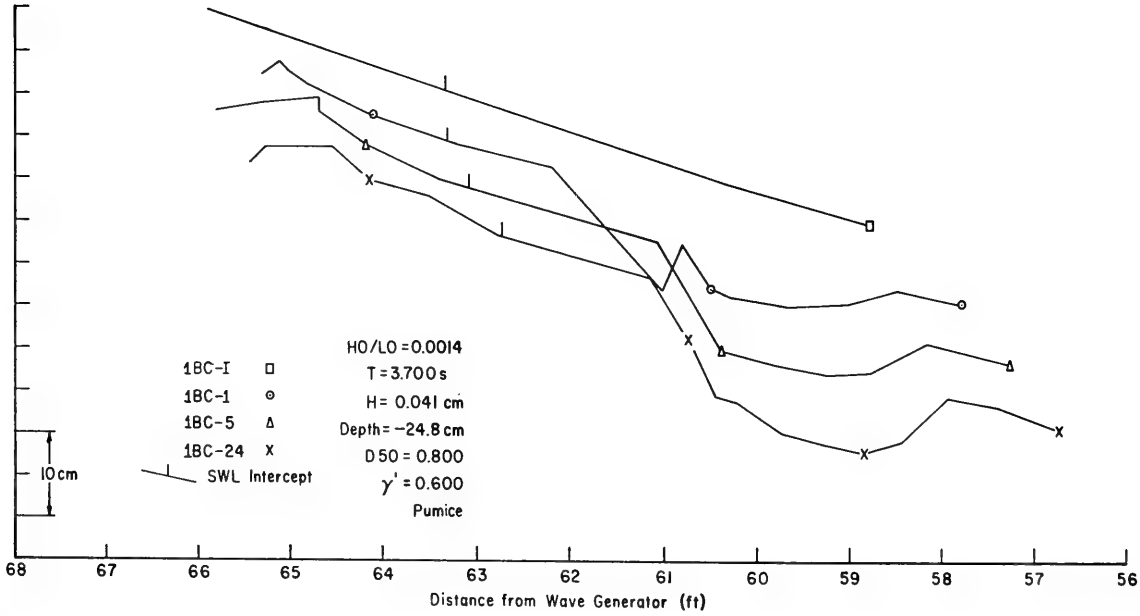

13C-I
13C-1
13C-5
13C-24
SWL Intercept
10 cm
H0/L0 = 0.0073
T = 2.200 s
H = 0.059 cm
Depth = −30.5 cm
D50 = 1.200
γ' = 0.300
Rocklite
69
68
67
66
65
64
63
62
61
60
59
58
Distance from Wave Generator (ft)


14C-I
14C-1
14C-5
14C-24
SWL Intercept
H0/L0 = 0.0073
T = 2.200 s
H = 0.059 cm
Depth = -30.5 cm
D50 = 0.800
γ' = 0.600
Pumice
10 cm
69
68
67
66
65
64
63
62
61
60
59
58
57
Distance from Wave Generator (ft)


15C-I
15C-1
15C-5
15C-24
SWL Intercept
10 cm
H0/L0 = 0.0013
T = 4.280 s
H = 0.052 cm
Depth = −32.7 cm
D50 = 1.200
γ' = 0.300
Rocklite
68
67
66
65
64
63
62
61
60
59
Distance from Wave Generator (ft)


16C-I
16C-1
16C-5
16C-24
SWL Intercept
10cm
H0/L0 = 0.0013
T=4.280s
H=0.052cm
Depth=-32.7cm
D50=0.800
γ'=0.600
Pumice
69
68
67
66
65
64
63
62
61
60
59
58
Distance from Wave Generator (ft)


17C-I
17C-1
17C-5
17C-24
SWL Intercept
10 cm
H0/L0 = 0.0014
T=3.700 s
H=0.041 cm
Depth = −24.8 cm
D50 = 1.200
γ' = 0.300
Rocklite
68
67
66
65
64
63
62
61
60
59
58
57
56
Distance from Wave Generator (ft)


1BC-I
1BC-1
1BC-5
1BC-24
SWL Intercept
10cm
H0/L0 = 0.0014
T = 3.700 s
H = 0.041 cm
Depth = −24.8 cm
D50 = 0.800
γ' = 0.600
Pumice
68
67
66
65
64
63
62
61
60
59
58
57
56
Distance from Wave Generator (ft)

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